REPORT TO CONGRESS

STUDIES OF URBAN-RURAL AND RELATED GEOGRAPHICAL ADJUSTMENTS IN THE MEDICARE PROSPECTIVE PAYMENT SYSTEM

OTIS R. BOWEN, M.D.
SECRETARY

DEPARTMENT OF HEALTH AND HUMAN SERVICES

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Other contributing authors were: Philip Cotterill, Ph.D., Economist and Chief of the Long Term and Special Studies Branch, Division of Reimbursement and Economic Studies; Fred Thomas, Economist, Division of Reimbursement and Economic Studies; Jerry Cromwell, Ph.D., President, Health Economics Research, Inc.; Ann Hendricks, Ph.D., Economist, Health Economics Research, Inc.; and Gregory Pope, Economist, Health Economics Research, Inc.

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STUDIES OF URBAN-RURAL AND RELATED GEOGRAPHICAL ADJUSTMENTS IN THE MEDICARE PROSPECTIVE PAYMENT SYSTEM

EXECUTIVE SUMMARY

The Social Security Amendments of 1983, the Deficit Reduction Act of 1984, and the Consolidated Omnibus Budget Reconciliation Act of 1985 mandate a series of studies of the geographical aspects of the PPS payment formula. Three of the studies deal with the use of standardized payment amounts (payment rates) computed on an urban-rural, regional, or hospital-specific basis. Two other studies concern the adjustment of the payment rates for differences in labor-related costs. The specific mandates addressed in this report are:

- Separate urban and rural payment rates -- Section 603(a)(2)(C)(i) of the Social Security Amendments of 1983 mandated studies of "the feasibility and impact of eliminating or phasing out separate urban and rural DRG prospective payment rates."

- Regional payment rates -- Section 603(a)(2)(A) of the same Act mandated a study of "the impact of computing DRG prospective payment rates by census division, rather than exclusively on a national basis." Section 2311(f) of the Deficit Reduction Act of 1984 also calls for "a discussion of the relative merits of a method of payment under which a percentage of the payment amount (for discharges classified within a diagnosis-related group) could be determined on a regional basis."

- Hospital-specific payment rates -- Section 2311(f) of the Deficit Reduction Act of 1984 mandated "a study of further refinements which may be appropriate in the inpatient hospital prospective payment provisions of Title XVIII of the Social Security Act, in order to address the problems of differences in payment amounts to specific hospitals."

- Urban wage index -- Section 9103 of the Consolidated Omnibus Budget Reconciliation Act of 1985 mandates a study of refinements in the urban wage index, specifically consideration of distinguishing between the central city core and the suburban ring of metropolitan areas.

- Varying proportions of labor and non-labor components among DRG's -- Section 2311(e) of the Deficit Reduction Act of 1984 also mandates "a study of the distinction between urban and rural hospitals for purposes of the DRG payment provisions under section 1886(d) of the Social Security Act, and the effect which such distinction may have on rural hospitals in the case of those DRG's which do not vary significantly between urban and rural areas (such as those DRG's which involve expensive medical devices.)" This section also requires investigation of the advisability and feasibility of varying by DRG the proportions of the labor and nonlabor components of the Federal payment amount instead of applying the average proportion of those components to all DRG's.

The mandated studies reflect concerns that PPS avoid or minimize unintended adverse consequences and ensure that outcomes in general are reasonable and equitable. This report addresses these concerns by examining the following questions:

- Are refinements needed to assure that hospitals are not systematically advantaged or disadvantaged under PPS by virtue of their geographical location?

- What types of refinements would be desirable? Three broad types of modifications were considered:

  -- Refined adjustments for differences in the "output" of hospitals, as measured by case mix or possibly by the scale and scope of services

  -- Refined input price adjustments, such as alternative ways of defining urban and rural labor market areas and varying the labor-nonlabor proportions by DRG

  -- Other geographical adjustments, such as retaining regional and hospital-specific rates

Extensive computer analyses of Medicare and American Hospital Association data were conducted for this report. A micro-simulation model was used to examine the relationship between hospitals' PPS operating payments and their operating costs (the Medicare "operating margin"). The data analyses yielded the following major findings:

1. Simulated Medicare operating margins imply that the technical changes in the method of computing the payment rates, enacted in OBRA 1986, will correct a systematic payment bias that has favored urban hospitals at the expense of rural hospitals. OBRA 1986 replaces a uniform 5 percent rate adjustment for outlier payments with separate urban and rural adjustments and replaces hospital-weighting with case-weighting in the computation of the rates.

2. Under current law, several groups of hospitals that receive special treatment under PPS are expected to be unfairly advantaged:

   - o Disproportionate share hospitals (DSH). The simulated operating margin for all rural DSH hospitals is 100 percent greater than the margin for all rural hospitals. The operating margin for urban DSH hospitals of less than 100 beds is expected to be almost as high as that for rural DSH hospitals. The operating margin for urban DSH hospitals of more than 100 beds is expected to be only slightly greater than the margin for all urban hospitals.

   - o Rural Referral Centers (RRCs). RRCs are expected to have an operating margin that is two-thirds greater than the margin for all rural hospitals. More detailed analyses and recommendations for RRCs are presented in a separate report.

   - o Teaching hospitals. Hospitals with large teaching programs (a resident-to-bed ratio greater than .25) are expected to have an operating margin about 20 percent higher than the margin for all urban hospitals.

3. Simulated margins imply that, as a group, small hospitals (those with fewer than 100 beds) will be systematically advantaged. The result is especially striking for rural hospitals with fewer than 50 beds, whose simulated margin is 50 percent higher than that of all rural hospitals. In contrast, the operating margin of sole community hospitals is only one-half that of all rural hospitals. The special situation of sole community hospitals is addressed in a separate report.

4. Overall, hospitals in the central city core of metropolitan areas do not appear to be be disadvantaged relative to suburban ring hospitals. This result most likely can be attributed to the fact that many core hospitals qualify for indirect medical education and/or disproportionate share payments. The main effect of a core-ring wage index would be to eliminate above average margins for a subset of suburban ring hospitals.

5. Fully national rates in FY 1988 are expected to result in significant variation in Medicare operating margins among regions:

   - Simulated margins for urban hospitals in New England and the East North Central regions are only one-third and two-thirds as large as the margin for all urban hospitals.

   - Urban hospitals in 3 regions have simulated margins that are 20-30 percent higher than the margin for all urban hospitals. These regions are Middle Atlantic, West North Central, and West South Central.

   - Rural hospitals in 3 regions have simulated margins substantially lower than the margin for all rural hospitals. The Middle Atlantic, New England, and East North Central margins are approximately one-fourth, one-half, and two-thirds of the overall rural margin.

   - Among rural hospitals, only one region stands out with a simulated margin substantially greater than the overall rural margin. The West South Central margin is 50 percent higher than the rural average.

Refined hospital "output" measures

Separate urban and rural payment rates are a means of accommodating the fact that, on average, urban hospitals have higher operating costs per case than do rural hospitals, after controlling for differences in DRG case mix and the wage index. The PPS adjustments for teaching, disproportionate share, and rural referral center hospitals are further accommodations to the fact that separate urban and rural rates do not account for high cost hospitals within the urban and rural groups.

Findings #2 and #3 above indicate the problems with this approach. First, relatively high cost hospitals identified for special treatment tend to be overcompensated. Second, within the urban and rural groups, relatively low cost hospitals tend to reap windfalls.

Research suggests that these problems could be mitigated by incorporating into PPS refined measures of hospital "output." Research on these refinements should focus on urban-rural differences in the style of practice. Physicians in urban hospitals practice a more technology-intensive style of medicine that is not reflected in measures of DRG case mix or severity of illness. There is a strong correlation between procedure intensity, hospital size, and teaching activity. Research suggests that the extent to which a hospital receives patients on referral could be used to capture these differences in place of, or in addition to, some combination of the urban-rural and teaching measures. In time, it might be possible to develop a PPS with one or more continuous payment variables (such as a referral index) that is used to adjust a single national payment rate. Such an adjustor could account for observed urban-rural and bedsize cost differences in a more graduated fashion that is more closely related to the underlying sources of cost variation. Teaching, disproportionate share, and rural referral center adjustments would all be reevaluated in a single rate system of this type.

Refined input price measures

Detailed analyses were conducted of wage differences among urban and rural hospitals. These analyses supported the hypotheses that urban core

hospitals pay higher wages than suburban ring hospitals; and rural hospitals closer to urban areas pay higher wages than rural hospitals in more outlying areas. These findings suggest the desirability of further refinement of the PPS wage adjustment, but do not yield easy methods of doing so. Additional findings to be noted in considering wage index refinements include the following:

- The current wage index is not a source of major payment inequities. Only 17 percent of urban hospitals and 20 percent of rural hospitals have wage indexes that are less than 95 percent of their own wages.
- As noted earlier, simulated operating margins do not reveal a disparity between the group margins of urban core and suburban ring hospitals.
- An alternative wage index, based on a core-ring distinction for all urban areas and BEA-based rural wage areas, produced a small reduction in the variation of simulated operating margins among selected categories of hospitals.
- Most of the impact occurred within urban areas. Suburban ring hospitals would experience a noticeable decline in operating margins. The proportion of core and ring hospitals with operating margins in excess of 20 percent would be more equal. However, core hospitals as a group are overcompensated relative to ring hospitals.
- Several issues need to be resolved to demonstrate that a core-ring wage index would improve PPS payment equity. Chief among them is the interaction of core-ring location with teaching and disproportionate share status.
- Although research will continue on further refinements of the wage index for rural areas, no clear improvement over the current index is available at this time.

Differences in the prices of hospital inputs other than labor were also investigated for this report. The main conclusion of this effort was that there are currently no data available that would either permit adequate testing of hypotheses about variation in nonlabor prices, or form the basis for an index that could be used in PPS.

Finally, variation in the proportion of labor-nonlabor costs among DRGs was examined. Concern was expressed that hospitals in low-wage areas would be disadvantaged in treating DRGs with high proportions of nonlabor costs. In assuming a constant labor share for all DRGs, PPS would underpay these hospitals for DRGs with relatively low labor cost shares by adjusting too much of their payment by the low wage index. The same logic implies that underpayment may also occur for labor intensive DRGs in high-wage areas. In addition, overpayment may occur for nonlabor intensive DRGs in high-wage areas and for labor intensive DRGs in low-wage areas. Depending on the extent of variation in labor shares across DRGs and the possibilities for over and under payment to occur within the same hospital, these biases might not have an appreciable impact at the hospital level. The analysis found that variation in labor shares across DRGs is small and is further reduced when hospitals' entire case mix is taken into account. These offsetting factors minimize any systematic bias from the use of a constant labor share.

Other geographical refinements

Differences in 4 PPS variables (DRG case mix, wages, teaching activity, and urban-rural location) explain about three-fourths of

regional differences in operating costs per discharge. However, the remaining variation, whose effects are reflected in the regional variation in operating margins presented earlier, cannot be explained by existing PPS adjustments or any of the refined measures of hospital output or input price differences studied for this report.

A number of county economic and demographic conditions were examined and were found to account for about two-fifths of the regional cost variation not explained by the 4 PPS variables. County population density, rental housing costs, and per capita income were the most important variables. The impact of these variables on hospital costs is indirect, and may be due either to regional variations in hospital outputs or input prices not captured by PPS, or to regional variations in efficiency.

Continuation of the regional and hospital specific rates are ways of correcting for these potential biases. Regional rates would shelter certain geographically concentrated groups of hospitals and reduce potential windfalls to others. However, as hospitals respond to PPS incentives, and as additional refinements are incorporated, the need for regional rates may be eliminated.

It might appear that retaining hospital specific rates would automatically adjust for imperfections in the payment formula, and to a certain extent it would. However, the simulation analysis produced an interesting result. The main impact of retaining hospital specific rates would be to reduce the number of hospitals with large positive operating margins. The number of hospitals with large negative operating margins

would not be reduced. This result highlights the fact that costs have changed significantly for some hospitals since the 1982 hospital specific base year. The longer the original hospital specific rates are used, the more important becomes the issue of updating them. All things considered, the principal argument against retaining hospital specific rates is that varying payment rates among hospitals in a single locality would be perpetuated, thereby providing a competitive advantage to hospitals with higher historical costs, regardless of the reason for the higher costs.

Finally, even if regional and hospital specific rates were retained, it is not clear what weight should be given each component. The simulations conducted for this report do not offer clear cut guidelines on this issue. It is only possible to identify potential winners and losers under alternative circumstances. It is not possible to assess whether one set of winners and losers is more appropriate than another.

Chapter 1

INTRODUCTION

Public Laws 98-21 (the Social Security Act Amendments of 1983), 98-369 (the Deficit Reduction Act of 1984), and 99-272 (the Consolidated Omnibus Budget Reconciliation Act of 1985) mandate several studies related to geographical variations in hospital inpatient payments under the Medicare Prospective Payment System (PPS). The studies are required to examine the effects of geographical location on hospitals' inpatient operating costs and to evaluate potential refinements in the ways that geographical location affects hospitals' PPS payments for inpatient operating costs.

Geographical location has its most direct effect on a hospital's PPS payments through the federal standardized payment amounts (the prospective payment rates.) Urban hospitals receive a higher payment rate than do rural hospitals. For a portion of their payments during the transition period, hospitals in different regions of the country receive different payment rates. Location also determines the specific adjustment made to the rates to account for geographical differences in the prices of labor-related inputs.

Separate urban-rural and regional rates were incorporated into PPS as part of a series of responses to widespread concern that PPS might create undue financial pressure for many hospitals. As enacted under the Social Security Amendments of 1983, the basic payment rate includes hospital-specific, regional, and national rates, which were to be

combined or "blended" during a 3-year transition period. Over the course of the transition, the combined share of the hospital-specific and regional rates decreases, and the national rate becomes an increasingly important part of the overall rate. At the end of the transition, payments are to be based on national urban and rural rates. The Consolidated Omnibus Budget Reconciliation Act of 1985 amended the Social Security Amendments of 1983 to extend the 3-year transition to a fully national prospective payment system by one additional year.

Separate urban and rural payment rates, regional rates, and the blending of rates are the focal issues of this report. These elements of the PPS payment structure provide a means of compensating for the fact that urban-rural and regional cost differences are not fully accounted for by the factors explicitly acknowledged by PPS: case mix, wage levels, teaching activity, and disproportionate share status. Other compensatory elements of the PPS system that are geographical in nature are the special treatment accorded rural referral centers and sole community hospitals. The results of mandated studies of these types of hospitals are summarized in this report.

Compensatory elements have found their way into the PPS payment system for two reasons. First, to the extent that important determinants of hospital costs have not been incorporated explicitly, their effects may have been at least partially captured through one or more of the compensatory elements. Second, to the extent that the adjustments for case mix, wage levels, teaching activity, and disproportionate share status do not fully or accurately capture those effects, compensatory elements may at least partially offset the limitations implicit in those

This report also addresses two mandates specifically related to potential limitations of the PPS adjustment for differences in labor-related costs (variation in the proportion of labor-related costs across DRGs and potential refinements of the urban wage index.) A more detailed accounting of the specific mandates that are related to locational or geographical PPS issues follows.

THE CONGRESSIONAL MANDATES

The Social Security Amendments of 1983, the Deficit Reduction Act of 1984, the Consolidated Omnibus Budget Reconciliation Act of 1985, and the Omnibus Budget Reconciliation Act of 1986 mandate a total of 9 studies of the geographical aspects of the PPS payment formula. This report focuses on 5 of those mandates:

- Separate urban and rural payment rates -- Section 603(a)(2)(C)(i) of the Social Security Act Amendments of 1983 mandated studies of "the feasibility and impact of eliminating or phasing out separate urban and rural DRG prospective payment rates."

- Regional payment rates -- Section 603(a)(2)(A) of the same Act mandated a study of "the impact of computing DRG prospective payment rates by census division, rather than exclusively on a national basis." Section 2311(f) of the Deficit Reduction Act of 1984 also calls for "a discussion of the relative merits of a method of payment under which a percentage of the payment amount (for discharges classified within a diagnosis-related group) could be determined on a regional basis."

- Hospital-specific payment rates -- Section 2311(f) of the Deficit Reduction Act of 1984 mandated "a study of further refinements which may be appropriate in the inpatient hospital prospective payment provisions of Title XVIII of the Social Security Act, in order to address the problems of differences in payment amounts to specific hospitals."

- Varying proportions of labor and non-labor components among DRG's -- Section 2311(e) of the Deficit Reduction Act of 1984 also mandates "a study of the distinction between urban and rural hospitals for purposes of the DRG payment provisions under section 1886(d) of the Social Security Act, and the effect which such distinction may have on rural hospitals in the case of those DRG's which do not vary significantly between urban and rural areas (such as those DRG's which involve expensive medical devices.)" This section also requires investigation of the advisability and feasibility of varying by DRG the proportions of the labor and nonlabor components of the Federal payment amount instead of applying the average proportion of those components to all DRG's.

- Urban wage index -- Section 9103 of the Consolidated Omnibus Budget Reconciliation Act of 1985 mandates a study of refinements in the urban wage index, specifically consideration of distinguishing between the central city core and the suburban ring of metropolitan areas.

Although not specifically mandated, this report also contains findings about potential refinements of the rural wage index. Some results in this report also pertain to sole community hospitals and rural referral centers. In addition, the mandated studies of those types of hospitals will be summarized in this report. However, since much useful analysis of these hospitals could not feasibly be included in this report, two additional studies of these types of hospitals will be sent to the Congress under separate cover:

- Sole community hospitals -- Section 603(a)(3)(A) of the Social Security Amendments of 1983 requested "a study of an equitable method of reimbursing sole community hospitals which takes into account their unique vulnerability to substantial variations in occupancy."

- Rural referral centers -- Section 603(c)(3)(A) of the Social Security Amendments of 1983 requires a report on adjustments that might be approporiate for large teaching hospitals located in rural areas (known as rural referral centers.)

Finally, there are 2 additional issues that will not be addressed in this report. The Department is in the process of developing responses to the following issues:

- o Outlier and transfer payment policies -- Section 9113 of the Consolidated Omnibus Budget Reconciliation Act of 1985 requests a report on the impact of outlier and transfer payment policies on rural hospitals.

- o PPS impact on rural health systems -- In 1986, the Senate Appropriations Committee requested that the Department conduct a study of the short and long run impact of PPS on rural health care systems.

PLAN OF THE REPORT

The mandated studies reflect concerns that PPS avoid or minimize unintended adverse consequences and ensure that outcomes in general are reasonable and equitable. This report addresses these concerns by examining the following questions:

- o What differences characterize urban and rural hospitals and how is hospital location taken into account in the PPS payment formula? (Chapter 1)

- o How well do the compensatory elements in the PPS payment formula adjust for potential disparities in financial impact for the various urban-rural and regional groups of hospitals? What refinements need to be addressed? (Chapter 2)

- o How might the existing payment system be refined to appropriately address the disparities identified in Chapter 2? Three broad types of modifications are considered:

  - -- Refined adjustments for differences in the "output" of hospitals, as measured by case mix or possibly by the scale and scope of services (Chapter 3)

  - -- Refined input price adjustments, such as alternative ways of defining urban and rural labor market areas and varying the labor-nonlabor proportions by DRG (Chapter 4)

  - -- Other geographical adjustments, such as retaining regional and hospital-specific rates (Chapter 5)

The remainder of this chapter presents a brief characterization of urban and rural hospitals and changes in their costs between 1981 and 1984. It also discusses how hospital location is taken into account in the PPS payment formula. This discussion provides the background for assessing the basic issue of this report: whether PPS payments vary commensurately with efficient costs among hospitals in different geographical locations.

Chapter 2 examines whether the urban-rural and regional distinctions that are part of the current PPS payment formula create inequities for certain groups of hospitals. The chapter provides an assessment of the need for refinements, along with a discussion of the methods and data that can be used to develop refinements of the PPS. In order to identify payment-cost disparities for different urban-rural and regional groups of hospitals, a microsimulation model was developed to estimate PPS operating payments to individual hospitals under a fully phased-in PPS. Results of the payment simulation were compared with hospital cost data from the first year of PPS. The findings presented in Chapter 2 provide a benchmark against which alternative payment formulas can be evaluated.

Chapters 3, 4, and 5 discuss the justification for modifying the treatment of location in the payment formula, potential refinements to the payment formula, and methods of incorporating any refinements implied by the analysis. The primary adjustments in the PPS payment formula are those for differences in hospital "output" (primarily case mix) and input price differences. To the extent that these two adjustments can be refined, the need for compensatory elements may be reduced or eliminated. Chapter 3 discusses potential refinements in hospital output measures. Chapter 4 explores refinements in input price measures.

Chapter 5 covers the remaining compensatory factors, such as retaining regional or hospital-specific rates. Finally, a discussion of the special treatment of rural referral centers and sole community hospitals under PPS is presented in Appendexes A and B respectively. Many of the analyses presented are drawn from technical studies prepared specifically for this report by the Center for Health Economics Research (Cromwell, Hendricks, and Pope, 1986).

CHARACTERISTICS OF URBAN AND RURAL HOSPITALS

Hospitals are defined for Medicare purposes as "urban" if they are located within a Metropolitan Statistical Area (MSA), and "rural" if located outside the MSA boundary. Of the approximately 5,800 acute care hospitals in the United States, 48 percent are categorized as rural by this definition, and 52 percent are classified as urban. Since urban hospitals are three times larger on average than rural hospitals, it is not surprising that urban hospitals admit about 75 percent of the nation's inpatients, and consequently, have a much larger number of admissions per hospital.

In 1984, urban hospitals had, on average, 3 times as many beds as rural hospitals. The occupancy rate was also much higher for urban than for rural hospitals (77 percent versus 45 percent). Medicare length of stay (LOS) for urban hospitals was almost two days longer than the rural LOS. The average case mix index is approximately 10 percent higher for urban than for rural hospitals. Urban hospitals were less dependent upon Medicare payments than rural hospitals. These differences are summarized in Table 1.1.

In total, there are roughly the same number of acute care rural hospitals as urban: 3,041 urban versus 2,780 rural. However, the distribution of urban and rural hospitals by State varies greatly. There are no hospitals classified as rural in the District of Columbia, New Jersey, and Rhode Island, while over 90 percent of the hospitals in Idaho, Montana, and South Dakota are classified as rural. Seventeen of the continental states have a majority of urban hospitals, while the balance have a majority of rural hospitals. Texas and California have the greatest number of hospitals, each with approximately 500. Rural hospitals comprise roughly half of Texas hospitals compared to only 13 percent of California hospitals.

Differences in Costs Between Urban and Rural Hospitals

Medicare cost reports for the first PPS year show that the Medicare cost per case was 65 percent higher for urban hospitals than for rural hospitals: $3,372 versus $2,045 (Table 1.1). This difference can be attributed, in large part, to differences in the factors that are used to adjust the basic DRG payment rates: labor costs; case mix, and teaching activity.

Labor costs and the associated fringe benefits represent approximately three-quarters of the average hospital's costs, exclusive of capital and direct medical education costs. The HCFA wage index used for PPS payment purposes compares the relative labor costs for each urban and rural wage area. Rural hospitals had an average wage index value of .864, while urban hospitals had an average value of 1.09. In addition, more resource intensive cases are treated in urban hospitals, as indicated by their case mix index (CMI). In the first year of PPS, urban

TABLE 1.1: CHARACTERISTICS OF URBAN AND RURAL ACUTE CARE HOSPITALS, 1981-1984

	Urban Hospitals		Rural Hospitals	
	1981	1984	1981	1984
Average Bed Size	251	237	76	74
Average Number of Admissions				
Total Admissions	9,543	9,380	3,117	2,733
Medicare Admissions	2,518	2,994	1,010	1,046
Percent Medicare Admissions	26%	32%	32%	38%
Average Length of Stay				
All Patients	7.1	6.9	5.8	5.5
Medicare Patients	10.2	8.2	8.1	6.4
Occupancy Rate	72%	77%	56%	45%
Case Mix Index	1.04	1.10	0.96	1.00
Medicare Operating Cost per Case	$2,817	$3,372	$1,603	$2,045

Sources: Medicare Cost Reports, American Hospital Association Annual Survey of Hospitals, and MEDPAR files.

hospitals had an average CMI value of 1.10. In contrast, rural hospitals had an average CMI value of 1.00. Finally, residency training activities are almost exclusively conducted in urban hospitals. The presence of such programs have been shown to be associated with higher costs per case, even after adjusting for wage and case mix differences, and other factors affecting hospital costs.

Since urban hospitals pay higher wages, have a more resource intensive case mix, and conduct most residency training activities, it is to be expected that urban hospitals will be more costly. However, these factors, while perhaps the most important, are not the only factors that affect hospital costs, nor do they explain all of the difference in cost between urban and rural hospitals. It was for this reason that separate urban and rural PPS payment rates were established.

Changes in Cost Patterns: 1981 - 1984

The national and regional prospective payment rates are based on Medicare hospital cost reports for reporting periods ending in 1981. These base period cost data were inflated, standardized, and grouped into the 20 average standard amounts per discharge according to urban-rural designation in each of the nine census devisions and the nation. Differential rates of increase in costs for urban and rural hospitals over time would have clear implications for the performance of urban and rural hospitals under PPS, irrespective of any payment inequities that may exist.

From 1981 to 1984, Medicare cost per case for urban hospitals increased 19.7 percent, from $2,817 to $3,372. The corresponding rate of increase for rural hospitals was 27.6 percent, from $1,603 in 1981 to

$2,045 in 1984. Since this measure is influenced by changes in both the total cost and the number of discharges, a change in either will affect the comparison.

Between 1981 and 1984, both groups of hospitals experienced about a 20 percent reduction in Medicare length of stay. Over the same period, urban hospitals increased their average number of Medicare admissions by 19 percent, from 2,518 to 2,994, whereas rural hospitals showed a smaller gain of 4 percent, from 1,010 to 1,046. Total admissions for rural hospitals dropped more than 13 percent over this period, compared to a decline of 2 percent for urban hospitals. Urban hospitals reduced their average bedsize by 6 percent, from 251 in 1981 to 237 in 1984. Rural hospital bedsize declined only 2.6 percent, from 76 to 74 beds on average.

All of these factors were responsible for a 20 percent reduction in rural hospital occupancy rates, from 56 percent in 1981 to 45 percent in 1984. Urban occupancy rates, on the other hand, actually increased from an average of 72 percent in 1981 to 77 percent in 1984.

As a result of these changes in utilization, rural hospitals have experienced a much larger increase in the average cost per discharge. Many costs are unrelated with the caseload level because such costs must be incurred regardless of activity. Examples of such costs include administrative costs, utilities, interest expenses, etc. Spreading these fixed costs over a smaller number of cases will, of necessity, result in a higher average cost. When comparing the average costs of urban and rural hospitals over time, the change in utilization between the PPS base year and 1984 makes the rural hospitals appear relatively more costly than if the volume of total admissions stayed the same for both groups. This change in utilization is largely responsible for the differential

rates of increase in costs for urban and rural hospitals. and, as we shall see in Chapter 2, for the difference in the operating margins between urban and rural hospitals in the first year of PPS.

THE PPS PAYMENT FORMULA

Under an ideal payment system, hospitals would be paid the efficient costs of treating their patients. However, the necessary information to design and implement an ideal payment system is lacking. The PPS payment formula is based implicitly on a model of the factors that determine hospital costs. (A detailed description of the model is found in Cromwell, Hendricks, and Pope (1986).) The cost model and the principle that hospitals should not be penalized or rewarded for cost factors beyond their control play important roles in defining the PPS payment formula. Two types of factors from the cost model are recognized as being generally beyond the control of a hospital:

- the type of hospital services needed by the hospital's patients
- the prices of the resources used in producing hospital services (e.g., labor, food, medical supplies, etc.).

Hospitals need to provide the services that their patients require. The transition from the cost model to the payment formula requires important decisions about how this need should be acknowledged. The dimensions of the problem (diagnosis, severity, quality) are not always easily identified, much less quantified.

The primary way that PPS acknowledges this need is by paying according to case mix using the DRG relative weights, so that cases that tend to require more resources receive higher payment. Other differences

related to the scale, scope, and complexity of inpatient hospital services are not directly taken into account. However, these differences are at least partially captured by the additional payments to hospitals for indirect medical education costs and for unusually expensive cases (outlier cases). Additional payments are also made for serving a disproportionate share of low income patients.

PPS also attempts to hold hospitals harmless for differences in the prices of the resources they use in producing services. Since hospitals must compete with one another, and to a lesser extent with other business firms, for the inputs they purchase, individual hospitals rarely exert much influence on input prices. PPS adjusts for differences in resource prices using the wage index for labor-related costs and, in the case of Alaska and Hawaii hospitals, a cost of living index for nonlabor-related costs.

PPS payments for inpatient operating costs are composed of three basic elements: (1) the prospective payment rates, which are adjusted by a wage index to account for differences in hospitals' labor-related costs; (2) the DRG relative weights; and (3) additional payments for hospitals that serve a disproportionate share of low income patients, for the indirect costs of medical education, and for unusually expensive cases (outlier cases).

The location of a hospital most directly affects its payment through the first of the three elements above, the prospective rates. An understanding of the current PPS rate determination process is necessary in order to identify potential options for refining the PPS payment

formula with respect to hospital location. There are three steps in the determination of the PPS payment rates:

- Standardization of base year hospital cost per case data for differences in case mix, wage rates, disproportionate share status, and teaching activity (the payment variables)
- Grouping of hospitals by regional and urban-rural location in calculating average standardized costs (the payment rates)
- Blending of the different payment rates.

First, each hospital's base year cost per case is standardized to control for the effects of differences in wages, case mix, disproportionate share status, and teaching activity. Standardization is necessary because payment adjustments are made directly for these four variables. The process of standardization involves deflating or inflating each cost per case value for these factors, so that the base year standardized cost per case indicates what each hospital's average cost per case would be if the hospital had a wage index of 1.0, a case mix index of 1.0, no disproportionate share of low income patients, and no teaching programs. The effects of these factors are removed in constructing the payment rates, because in computing payments for each hospital, adjustments are made for the extent to which each hospital differs from the standard values (1.0) for the wage index, case mix, disproportionate share status, and teaching activity. By adopting these specific adjustments, PPS tries not to penalize hospitals for certain factors that cause higher costs regardless of the hospital's efficiency, and to avoid over or under compensation for these factors.

The second step in determining the payment rates involves grouping hospitals by region and urban-rural location prior to computing averages

of the hospital standardized cost per case values. These regional, urban-rural payment rates capture the average effects of all other sources of geographical cost differences that were not eliminated from the cost per case data in the standardization process.

Standardization is generally the preferred method for taking account of appropriate cost differences because it involves the use of continuous variables (e.g., the wage index and the case mix index) and avoids the problem of defining the boundaries of discrete groups (e.g., urban versus rural location). However, when the information needed for a continuous adjustment is unavailable, different payments for discrete groups of hospitals may be preferable to no adjustment. Also, if the continuous adjustment employed in the standardization process suffers from limitations that prevent it from fully capturing appropriate cost differences, an additional discrete payment adjustment may be desirable.

Consider the definition of urban and rural hospitals. "Urban" currently indicates that a hospital is located in a metropolitan statistical area (MSA). "Rural" means that the hospital is located outside of an MSA. Conceptually, the definition of urban-rural status is based on markets for inputs. Thus, hospitals that face the same wage rates and other input prices, or similar location-related input costs, such as security costs, should be defined as being in the same area for the purposes of input price adjustments. In turn, the input price adjustment is made through standardizing the cost data. The further grouping of hospitals by geographical location in computing separate payment rates represents an implicit adjustment for factors not fully captured by standardization.

Hence, separate regional and urban-rural rates can be viewed as a less than optimal way of compensating for limitations of the adjustments for differences in input prices, case mix, disproportionate share status, and teaching activity. In addition, to the extent that location and other factors not explicitly recognized in the payment formula (severity or complexity of hospital cases not reflected in the DRG case mix index, scope of services, practice patterns, and efficiency) are correlated, the grouping process implicitly compensates for these factors, at least partially. Because it is a relatively imprecise method of making adjustments, grouping hospitals for the computation of separate payment rates will tend to capture a mixture of appropriate and inappropriate sources of cost differences.

The final step in the rate determination process is the blending of hospital-specific, regional, and national rates. Over the course of the transition period, the combined share of the hospital-specific and regional rates decreases, and the national rate becomes an increasingly important part of the overall rate. At the end of the transition, payments are to be based on national urban and rural rates. There are two possible justifications for blending separate payment rates. First, blending may be done simply as a transitional matter to allow time for hospitals to adjust to the full impact of national rates. Second, particularly in the case of blending the hospital-specific rate with a regional or national rate, blending may compensate for limitations of the explicit adjustments in the PPS payment formula. In this regard, the hospital-specific rate is a more comprehensive way of adjusting for these limitations. Of course, the disadvantage is that the hospital-specific

rate reflects all sources of cost differences, those that PPS wants to take into account and those that PPS does not want to take into account.

Finally, it is important to note that two special categories of rural hospitals have been created for the Medicare prospective payment system: sole community hospitals and rural referral centers. Sole community hospitals must meet certain location criteria to establish that they are the sole source of inpatient hospital services reasonably available to individuals in a geographic area who are entitled to Part A Medicare benefits. Hospitals that are classified as sole community hospitals may receive 75 percent of their PPS payments on a hospital specific basis indefinitely, whereas other hospitals will be phased into a fully federal payment system. Approximately 350 hospitals have been designated as sole community hospitals for purposes of the Medicare prospective payment system. Rural referral centers, on the other hand, must meet or exceed certain case mix and discharge criteria to establish that they are more comparable to urban acute care facilities than to typical rural hospitals. Hospitals designated as rural referral centers receive the urban rather than rural payment rate for as long as they continue to meet the criteria. There are approximately 170 facilities that have been designated as rural referral centers for purposes of the Medicare PPS.

SUMMARY

The introductory chapter has discussed the legislative mandate for this report and provided background information on the manner in which hospital location is taken into account in the PPS payment formula. In assessing refinements to the PPS payment formula, this report will also

have to consider the most appropriate manner of incorporating the refinements. Special emphasis will be placed on refinements to the payment variables and the standardization process, since as described above, that is the preferred approach.

The following chapter examines whether the urban-rural and regional distinctions that are part of the current PPS payment formula create inequities for certain groups of hospitals. The findings presented in Chapter 2 will provide a benchmark against which alternative payment formulas can be evaluated.

Chapter 2

ASSESSING THE NEED FOR REFINEMENTS

This chapter assesses the effects of the compensatory elements of the PPS payment formula, described in Chapter 1, on various urban-rural and regional groups of hospitals. The results provide several indications about the need for refinement of the PPS payment formula. The chapter begins with a discussion of the methods and data used to measure payment-cost relationships (payment equity). This is followed by the presentation of a series of simulation results.

Payment-cost simulations were conducted for the following situations:

- The first year of PPS
- A fully phased-in PPS that excludes the changes recently enacted in OBRA 1986
- A fully phased-in PPS based on cost report data from the first PPS year (rebased payment rates)
- A fully phased-in PPS that includes the OBRA 1986 changes

The simulation results are discussed in three sections:

- Impact of fully national rates prior to the OBRA 1986 changes. The results for the first PPS year are compared with those for a fully phased-in PPS prior to the OBRA 1986 changes. This comparison indicates payment-cost disparities associated with the adoption of fully national urban-rural payment rates and the elimination of the hospital-specific and regional rates.

- Impact of rebased payment rates excluding the OBRA 1986 changes. The results for a fully phased-in PPS using rates based on PPS-1 cost data rather than the 1981 data indicate the extent to which the payment-cost disparities described in the preceding section can be attributed to changes in cost relationships between 1981 and 1984. In turn, these results show the extent to which updating the data used in computing the rates would improve or worsen payment-cost relationships.

- Impact of fully national rates including the OBRA 1986 changes. The results for this simulation show the effects of the two technical changes in the method of computing the payment rates that were enacted in OBRA 1986 (replacing a uniform 5 percent adjustment with separate urban and rural adjustments to the rates for outlier payments; and replacing hospital-weighting with case-weighting in the computation of the rates.) This simulation is the most important for indicating the need for future refinements of the PPS payment formula.

MEASUREMENT OF PPS PAYMENT EQUITY

Ideally, payment equity would be assessed by comparing PPS payments with the efficient costs of treating Medicare beneficiaries. The "ideal Medicare operating margin" might be defined as the difference between PPS operating revenue and efficient operating costs, divided by efficient operating costs. This measure would indicate the relative profitability of each hospital under PPS. Payment equity would require that the ideal Medicare operating margin be equal for all hospitals, since any differences would be attributable to a failure of the PPS payment formula to adjust for differences in efficient costs.

Of course, since efficient costs are unknown, it is only possible to compute a Medicare operating margin based on actual Medicare costs, which represent an unknown combination of efficient and inefficient costs. Unequal margins between hospital groups under PPS may then be the result of either payment inequities in the PPS payment formula or differences in efficiency. If it could be assumed that PPS has forced most hospitals to

groups of hospitals could only be attributed to factors which are beyond the control of the hospital (i.e., payment formula inequities). In addition, if inefficiency is largely uncorrelated with other hospital characteristics such as size and location, then focusing on operating margins for groups of hospitals would reduce the chances of confusing differences in efficiency with payment formula inequities. Consequently, the difference in the group operating margins will be used in this report as the best available indicator of a need for refinement of the PPS payment formula.

Several additional qualifications should be noted: The Medicare operating margin is not a complete measure of profitability for two reasons. First, other cost components that are not paid prospectively (capital, return on equity, and direct medical education) are excluded. Second, revenues and costs for non-Medicare patients are excluded, so the measure indicates little about overall financial or efficiency performance. Exclusion of these elements permits us to focus on the effect of the PPS payment formula, which is the main subject of interest.

A Microsimulation Model of the Prospective Payment System

In order to identify the payment-cost disparities expected for urban, rural and other categories of hospitals, a microsimulation model was developed to estimate PPS operating payments to individual hospitals under alternative circumstances. The model simulates Medicare operating payments to 5,390 short term general hospitals in considerable detail. In addition to modeling the basic components of PPS payments on an individual basis (based on the historical costs, case mix index and discharges of the hospital), the model accounts for special treatment of

several types of hospitals: sole community hospitals, rural referral centers, hospitals in metropolitan areas that cross regional boundaries, and new providers. Cost per case data from the PPS-1 Medicare cost reports are also used to compute ratios of net Medicare operating revenues (Medicare operating revenues minus Medicare operating cost) to Medicare operating cost.

An attempt was made to include all hospitals currently expected to receive prospective payment. For this reason, hospitals in Maryland and New Jersey were excluded, as were New York hospitals that participate in the Rochester area and the Finger Lakes area demonstrations. The chief reason for excluding other hospitals from the simulation was the absence of a PPS-1 cost report.

In order to simulate PPS payments, the following information is required. First, the relevant hospital specific and Federal payment rates must be known. Determining the appropriate Federal payment rates requires information on the location of the hospital (the census division and urban or rural status). Second, determining the appropriate wage index to use in adjusting the Federal payment rates requires additional location information (the metropolitan statistical area for urban hospitals and the State for rural hospitals). The location information just described, together with case mix and discharge data, is sufficient to simulate basic DRG payments and outlier payments.

Additional data are required to simulate the additional payments for indirect medical education and disporportionate share. Simulation of the payments for indirect medical education requires the resident-to-bed

payments requires knowledge of bed size and urban or rural status, as well as estimates of the proportion of a hospital's total inpatient days provided to Medicaid recipients and the proportion of a hospital's total Medicare inpatient days provided to Medicare beneficiaries that are eligible for the Supplemental Security Income (SSI) program. Finally, it is useful to know whether special payment rules are applicable, such as those for sole community hospitals or rural referral centers.

The data used in the simulation model come from a variety of sources. Hospital location is obtained from records of Medicare certification. Case mix and discharge information is obtained from the FY 1984 and FY 1985 MEDPAR files that are derived from Medicare patient bills. Hospital specific rates, resident-to-bed ratios and special characteristics come from the Provider Specific file that is obtained from the fiscal intermediaries. The SSI percent was obtained by matching FY 1985 MEDPAR records of individual beneficiary bills against the Social Security Administration's SSI eligibility file. Bed size, cost per case, and percent Medicaid days were taken from the PPS-1 Medicare cost reports.

Operating Margin Measurement

In this report, the relative measure of profitability or the "operating margin" is defined as the excess of Medicare inpatient revenues over costs divided by medicare costs, which may be expressed algebraically as follows:

$$\text{Operating Margin} = \frac{(\text{Medicare Revenue} - \text{Medicare Cost})}{\text{Medicare Cost}}$$

For the first year of PPS, both the Medicare operating revenue per case estimate and the Medicare operating cost per case estimate are from the PPS-1 Medicare cost report. Federal payments for a fully phased-in PPS were modeled under policies expected to be included in the Health Care Financing Administration's final rule for fiscal year 1988. These policies were assumed to be identical to the policies included in the final rule for fiscal year 1987 (Federal Register, November 24, 1986), with the additional requirement that the FY 1988 rates were modified to be case-weighted rates as required by the Omnibus Reconciliation Act of 1986. DRG payments were simulated using the expected national urban and rural standardized payment amounts applicable to each hospital (except where modified for simulation purposes) multiplied by the applicable wage index value, the case mix index, and the number of Medicare discharges. Additional outlier payments were simulated by applying the proposed FY 1987 outlier criteria to each hospital's discharges as reported in the FY 1985 PATBILL file. Additional teaching payments were simulated by applying each hospital's indirect teaching adjustment factor (based on the resident-to-bed ratio as reported in the Provider Specific file) to the sum of the national and outlier payments. Special rules affecting payments to sole community hospitals, rural referral centers, and new providers were also included in the model.

In order to estimate costs comparable to payments for a fully phased-in PPS, the PPS-1 reported costs for each provider were inflated to the end of FY 1987 using the hospital market basket rates of increase over the relevant period as supplied by the HCFA Office of the Actuary. A key assumption in this report is that the average costs will not change in response to the implementation of full national rates. In reality,

some cost savings may be expected for hospitals that faced potential reductions in revenue. As a result, the operating margins presented in the subsequent analysis may be understated.

The following assumptions were used in conducting these simulations:

- all hospitals' fiscal year end dates were converted to September 30 to coincide with the federal fiscal year;
- all hospitals' 1984 Medicare cost data were deflated to September 30, 1983 and rolled forward to September 30, 1987 by the increase in the hospital market basket over this time period;
- all hospitals' FFY 1987 cases were assumed to be identical to their PPS-1 values; and
- all hospitals' FFY 1987 resident-bed ratios, disproportionate share adjustment factors and outlier experience were assumed to be identical to their PPS-1 values.

COMPARISONS OF PPS PAYMENTS AND COSTS

As discussed earlier in this chapter, the discussion of the simulation results is divided into three sections. The first section focuses on the effects of the transition from rates in the first PPS year (75 percent hospital-specific and 25 percent regional) to fully national rates excluding the technical changes enacted in OBRA 1986. This analysis identifies disparities associated with the use of national rates and the elimination of hospital-specific and regional rates.

The second section presents the results for rates based on PPS-1 data, which indicate the effects of incorporating into the PPS rate structure changes in costs per case between 1981 and 1984. The "rebased" rates were constructed using operating cost data from the PPS-1 cost reports. The associated adjustment factors (wages, case mix, resident to bed ratio, disproportionate share status) were also from the PPS-1

period. A budget neutrality adjustment was applied to the rebased rates so that PPS payments in the aggregate would be the same in all three of the simulations that use fully national rates.

The third section presents the results of including the technical changes required under OBRA 1986. Comparisons between this final simulation and the previous simulations isolate improvements in the distribution of the PPS payments as presently legislated. Hence the simulated margins using the OBRA 1986 rates provide the baseline to assess the impact of additional refinements to the PPS.

OBRA 1986 contains two technical changes to the PPS rate-setting process. The first requires that in the final step of the rate-setting process the standarized rates be computed on a case weighted basis as opposed to a hospital weighted basis that was used since the inception of PPS. Thus larger hospitals will have a much greater impact on the rate construction than before. OBRA 1986 also requires that the previous outlier adjustment in which both urban and rural PPS rates were reduced by a uniform five percent for anticipated outlier payments be replaced with a "differential outlier" adjustment. This means that the anticipated outlier experience for each urban and rural category be used to adjust the urban and rural rates for anticipated outlier payments. Since the outlier experience for urban hospitals is higher than for rural hospitals, this change will result in a larger adjustment to the urban payment rate relative to a uniform five percent reduction, and a smaller adjustment to the rural rate.

Two basic measures of financial impact were examined: (1) the impact of each refinement on Medicare operating margins among hospital groups; and (2) the distribution of operating margins among the hospitals within

each group. The first type of information permits comparisons of how different hospital groups would be affected on average under each option. The average operating margin for each of 40 different groups of hospitals was calculated by summing the excess of aggregate payments over costs for the group and then dividing by the total costs of the group. This average is influenced by the number of cases and the size of the hospitals within each group. The average is representative of the profitability that the group as a whole has or may exerience. It does not show nor represent the profit level that may be experienced by any particular hospital within the group.

The distribution of operating margins permits analysis of the proportion of hospitals in each group that would be affected to a specific extent. Of particular interest may be the proportion of hospitals that would experience particularly large reductions in operating margins under each option. In order to present the distribution of the operating margins, the margin of each hospital was tabulated in a frequency table. This table shows the percentage of hospitals that are expected to cover their Medicare operating costs or operate at a deficit based on the simulation, based on the following ranges:

- Hospitals with margins less than negative 20 percent
- Hospitals with margins greater than negative 20 percent, but less than zero
- Hospitals with margins greater than 0, but less than 20 percent
- Hospitals with margins greater than 20 percent

Impact of Fully National Rates Prior to the OBRA 1986 Changes

In the first year of PPS, the Medicare operating margin for all hospitals was 16.4 percent (Table 2.1). PPS payments in that year were based on a blend of a hospital-specific payment rate (75 percent) and a regional payment rate (25 percent). Under fully national pre-OBRA rates, that figure would be 12.6 percent, a decrease of about 25 percent. This estimate is based on the necessary assumption that each hospital's cost per case in 1987 dollars can be estimated reasonably accurately by adjusting its PPS-1 Medicare cost per case for input price increases between the PPS-1 year and federal fiscal year 1987.

In the first year of PPS, the operating margin for urban hospitals was about twice that for rural hospitals. Prior to the enactment of OBRA 1986, the transition to 100 percent national rates would not have been expected to change that imbalance. Although both the urban and rural hospital groups would have been expected to maintain positive operating margins under a fully phased-in PPS, approximately one third of all rural hospitals would have received Medicare payments less than their estimated operating costs (Table 2.2). By comparison, approximately 20 percent of the urban hospitals would have experienced negative margins. In the first year of PPS, the comparable percentages were 29 percent for rural hospitals and 10 percent for urban hospitals.

In the first year of PPS, the smaller bedsize groups showed operating margins substantially lower than the national group averages. After the transition to fully national rates, the profitability of these hospital categories is expected to increase to above the national group average. Urban hospitals under 100 beds had operating margins substantially lower

than the urban group average (14.2 percent versus 18.2 percent). After transition, the operating margins for this category would increase to substantially above the urban group average (19 percent versus 13.8 percent). Rural hospitals under 50 beds would experience a similarly large gain in profitability, from 6 percent in their first PPS year to over twice that amount in FY 1988, 12.5 percent. This hospital group, which had been the most unprofitable in the first PPS year, would be the second most profitable rural group by the end of the PPS transition. Only the rural referral centers would be expected to have a greater operating margin.

The finding that small hospitals will fare relatively better under under a fully phased-in PPS system is consistent with earlier studies of hospital costs. (See, for example, Pettengill and Vertress: "Reliabilty and Validity in Hospital Case-mix Measurement," Health Care Financing Review, Volume 4, Number 2, 1982) Such studies have identified a number of factors that affect hospital costs: differences in wage levels, case-mix severity, teaching activity, and location. These factors, while perhaps the most important, are not the only factors that affect hospital costs. Pettengill and Vertrees found that larger hospitals, even after adjusting for differences in wages, case-mix, teaching, and location have higher costs than smaller ones. Since hospital size is not recognized in the PPS system, it is not surprising that larger hospitals would tend to be disadvantaged under the PPS.

The simulation results also indicate that, after the transition period is completed, a prospective payment system based on pre-OBRA rates would have tended to favor other categories of hospitals as well.

Hospitals with extensive medical education activities or a disproportionate share of low income patients were estimated to have higher than average operating margins under such a payment system. One category of rural hospitals that were projected to fare well under such a system are rural referral centers (estimated operating margin of approximately 16 percent). The feature that all of these hospitals have in common is that they receive special treatment under PPS as a result of their status as teaching, disproportionate share, or rural referral hospitals. The teaching adjustment factor, the disproportionate share adjustment factor, and the rural referral center rate adjustment currently in use were attempts to correct for factors not recognized explicitly in the PPS. Our simulations indicate that they are imperfect corrections that tend to overcompensate teaching, disproportionate share, and rural referral hospitals relative to other hospitals. Because of the design features of PPS, any tendency to overcompensate one group of hospitals comes at the expense of other hospitals in the system.

The phase-in of fully national rates in FY 1988 appears to pose problems for certain regions of the country. In the absence of any behavioral changes on the part of hospitals in these regions, hospitals in the urban New England and the East North Central regions would be expected to have the lowest margins of the urban group: 4.7 percent and 8.7 percent respectively versus the national urban average of 13.8 percent. In 1984, the margins of these two regions were equal to or only slightly below the group average. The other urban regions would have group operating margins that are roughly in line with the national urban average.

Among rural hospitals, the Mid-Atlantic, New England, and East North Central regions would experience the lowest operating margins: -3.9, 1.6, and 3.3 percent respectively. More than 50 percent of the rural hospitals in the Mid-Atlantic region would not be expected to cover their Medicare operating costs, while the New England and East North Central regions would have approximately 40 percent of their rural hospitals unable to cover their costs. The balance of the rural hospitals would continue at roughly the same margin level as experienced in the first year of PPS or better under a fully phased-in system. The group average for one rural region, the West South Central, would be expected to double from 6.4 percent in PPS-1 to 12.5 percent in FY 1988.

Impact of Rebased Rates Excluding the OBRA 1986 Changes

In order to isolate the distributional effects related to the continued use of 1981 cost data as the base year for rate construction purposes, a simulation was conducted using rebased rates, the results of which are compared with a fully phased prospective payment system based on pre-OBRA rates. The rebased rates were further adjusted in order to assure that the overall operating margin will be the same under both systems, thereby permitting us to focus on the distributional consequences associated with the use of different base years for rate construction purposes.

Rebased rates under a fully national payment system would significantly narrow the gap between urban and rural hospital operating margins: 12.9 percent for urban hospitals versus 11.2 percent for rural hospitals. This would be a slight decline from the margins expected

under pre-OBRA rates for the urban hospitals. Rural hospitals, on the other hand, would experience an increase of 4.5 percentage points. The percentage of urban hospitals with negative operating margins would remain at about 20 percent, while the number of rural hospitals not covering the operating costs would drop from 33 percent to 23 percent.

The continued use of 1981 as the base year for rate standardization purposes accounts for a large part of the difference in the simulated urban and rural margins using pre-OBRA rates. As was pointed out in Chapter 1, differential rates of change in utilization of urban and rural hospitals over the 1981-1984 period was largely responsible for the differential rates of increase in costs for urban and rural hospitals. These changes were also responsible for the difference in the observed operating margins between urban and rural hospitals in the first year of PPS. Under a rebased rate structure, the difference in operating margin ratios between the urban and rural hospitals would be reduced from 2:1 to 1.15:1.

With the exception of reducing the urban-rural group margin difference, most of the distributional problems discussed for the pre-OBRA rates would continue under a rebased system. Smaller hospitals would continue to have higher margins than large hospitals. Urban hospitals under 100 beds would have a margin of 18.0 percent versus 14.2 percent for hospitals greater than 685 beds. Rural hospitals under 100 beds would have an operating margin of 14.7 percent versus 9.7 percent for rural hospitals with over 170 beds. Rural hospitals under 50 beds would be the most profitable rural group, with operating margins of 19.0 percent versus the rural group average of 11.2 percent.

Teaching hospitals would continue to be more profitable than non-teaching, although the gap under the rebased rate structure would be lessened. Disproportionate share hospitals would continue to be more profitable than non-DSH hospitals. Rural referral centers would also continue to be more profitable (16.3 percent) than the urban or rural group average (11.2 percent). Sole community hospitals would continue to have the lowest margins of the rural group.

Finally, there would also continue to be differences in operating margins across regions. The urban New England and East North Central and the rural New England, Mid-Atlantic, and East North Central regions would continue to have margins below the group average.

Impact of Fully National Rates Including the OBRA 1986 Changes

The finding that urban hospitals in general are estimated to fare better under a fully phased-in federal system can be attributed, in large part, to differences in utilization of urban and rural hospitals over the 1981-1984 period. However, this finding can also be attributed, in part, to two design features of the PPS: the reduction in federal rates required to support the outlier payment policy; and the use of hospital weighted rather than case weighted federal rates. The outlier payment policy as it is currently designed redistributes payments from hospitals with fewer outlier cases (e.g., rural hospitals) to hospitals with more outlier cases (e.g., urban hospitals). Also, in the rate construction process used prior to the passage of OBRA, a simple average of the standardized costs for each hospital was used to calculate the rates. No

As a result of the more unequal distribution of cases across rural hospitals, hospital weighted rates tend to disadvantage rural hospitals whereas case weighted rates tend to disadvantage urban hospitals.

The Omnibus Reconciliation Act of 1986 requires two technical changes to the PPS rate construction process. Effective October 1, 1986 OBRA requires that outlier adjustment factors be computed and applied separately for each urban/rural payment group. Prior to OBRA, both the urban and the rural rates were reduced by a uniform 5 percent even though the actual outlier rates vary by region and urban and rural group. Effective October 1, 1987 the "Secretary is to compute the urban and rural averages on the basis of discharge weighting, rather than hospital weighting...". The impact of both of these changes is presented below.

The financial impact of these two technical refinements to the PPS rate setting methodology was estimated by comparing operating margins under a fully phased-in version based on payment rates expected to be in effect in FY 1988. Payments were simulated by modeling a fully implemented PPS in which the calculation of the standardized payment amounts was identical to the process used in computing the standardized payment amounts published in the final rule for fiscal year 1987, with one exception. In the final step of the rate construction process, the mean adjusted cost per case for urban and rural hospitals were computed on a case weighted basis rather than a hospital weighted basis. This system, when compared with a system based on pre-OBRA rates, permits us to isolate the impact of differential outlier adjustments and case weighting on PPS operating margins for urban and rural hospitals, as well as other categories of hospitals.

The simulation results indicate that, after the transition period is completed, the Medicare prospective payment system as it is currently legislated will substantially reduce the disparity in urban and rural operating margins by increasing the rural operating margins from a projected 6.7 percent under the pre-OBRA PPS system to 11.9 percent. The urban margins will decrease from 13.8 percent to 12.9 percent. With the passage of OBRA, the differences between urban and rural margins will be even less than those that would be expected under a rebased system. However, the rate adjustments required by OBRA do not correct any of the other inherent distributional problems mentioned above. Smaller hospitals will continue to be more profitable than large hospitals. There will continue to be distributional problems by region. Teaching hospitals, disproportionate share hospitals, and rural referral centers will continue to be more profitable. As can be seen in Table 2.2, the overall impact of OBRA corresponds closely to the estimated impact of rebasing the prospective payment system with PPS-1 cost data.

SUMMARY

The simulation results indicate that, after the transition to fully national rates is completed, the prospective payment system will tend to favor certain categories of hospitals at the expense of others. Prior to the passage of OBRA 1986, PPS would have tended to favor urban hospitals at the expense of rural hospitals, and smaller hospitals at the expense of larger hospitals. It also would have tended to favor hospitals that receive special treatment under PPS: teaching hospitals, disproportionate share hospitals, and rural referral centers. With the passage of OBRA

1986, the disparity between urban and rural hospitals is largely eliminated. However, the rate adjustments required by OBRA do not correct any of the other inherent distributional problems. These results are further summarized in terms of the specific mandated studies identified in Chapter 1.

Separate urban and rural payment rates

The pre-OBRA simulations show a significant disparity between the operating margins of urban and rural hospitals. The finding that urban margins are twice as large as rural margins holds for both the fully national pre-OBRA rates and the first PPS year. This urban-rural disparity is expected to be corrected by the technical changes enacted in OBRA 1986. Coincidentally, rebasing the rates using PPS-1 data would have had almost the same effect as the OBRA 1986 changes. The chief disparity that can be expected to persist under current law is the pattern of margins among hospitals of different sizes. Small hospitals, especially those with fewer than 100 beds, can be expected to have significantly higher Medicare operating margins under separate urban and rural national rates than larger hospitals. This result applies to both urban and rural hospitals. The disparity in margins by size of hospital can be attributed to the use of separate urban and rural rates as a compensatory factor for the exclusion of the more direct effects of size from the PPS payment formula. Chapters 3 and 4 address the potential for refining measures of hospital output and input prices to reduce or eliminate urban-rural and bedsize disparities.

Regional rates

As would be expected, the elimination of regional rates changes the regional pattern of operating margins. The adverse effects appear to fall primarily on urban hospitals in the New England and East North Central regions, and on rural hospitals in the New England, Mid-Atlantic, and East North Central regions. The regional hospital groups that appear to gain the most from elimination of the regional rates are urban hospitals in the East South Central region and rural hospitals in the West South Central region. The OBRA changes alter the magnitude of the regional margins, raising rural margins significantly and reducing urban margins slightly, but do not alter the regional pattern of margins. That is, under current law, the same regions identified above can be expected to have significantly lower or higher margins than do the remaining regions. Further, rebasing would not alter the regional distribution of margins. Chapter 5 discusses options for narrowing the regional distribution of margins.

Rural referral centers

As a result of receiving the urban payment rate, rural referral centers as a group have above average operating margins in all of the fully phased-in simulations. Some findings for rural referral centers are discussed in Chapters 3 and 4. In addition, a summary of the Department's detailed report on rural referral centers appears in Appendix A.

Sole community hospitals

As a group, sole community hospitals are expected to have operating margins less than all rural hospitals. This result can be attributed largely to the fact that their payments continue indefinitely to be based on a blend of 75 percent hospital-specific and 25 percent regional rates. As a result, sole community hospitals do not benefit as do other small hospitals from the move to 100 percent national rates. The clear implication of this result is that many sole community hospitals would receive higher PPS payments if they gave up their sole community status. Hospitals in this situation face a tradeoff between the protection against large fluctuations in the volume of their admissions afforded under their sole community hospital status and the higher payments they would receive if that status were foregone. A summary of the Department's detailed report on sole community hospitals, which addresses the impact of fluctuations in the volume of their admissions, appears in Appendix B.

TABLE 2.1: ESTIMATED MEDICARE OPERATING MARGINS FOR THE FIRST YEAR OF PPS, A FULLY PHASED PPS BASED ON PRE-OBRA RATES, A FULLY PHASED PPS BASED ON REBASED RATES, AND A FULLY PHASED PPS BASED ON CURRENT LAW

		Medicare Operating Margins Under:		
	First Year of Medicare PPS	Pre-Obra System 100 Percent National Rates	Rebased System 100 Percent National Rates	Current System 100 Percent National Rates
Urban Hospitals by Bedsize:				
0- 99 Beds	14.2	19.0	18.0	17.9
100-404 Beds	16.9	13.0	12.1	11.9
405-684 Beds	20.0	14.1	13.2	13.0
685 + Beds	23.0	15.2	14.2	14.1
Rural Hospitals by Bedsize:				
0- 99 Beds	8.3	8.4	14.7	14.5
100-169 Beds	8.4	2.7	7.2	8.4
170 + Beds	9.3	8.0	9.7	11.3
Teaching Status:				
Nonteaching Hospitals	13.4	11.4	12.1	12.2
Resident/Bed .25	19.4	13.4	12.5	12.5
Resident/Bed .25	23.3	16.3	15.4	15.3
Disproportionate Share Status:				
Non DSH Hospitals	15.6	10.8	11.2	11.2
DSH Urban 100 Beds	18.7	16.5	15.5	15.4
DSH Urban 100 Beds	11.7	23.2	22.2	22.1
DSH Rural Hospitals	8.7	16.6	23.4	24.0
Other Special Status:				
No Special Status	16.9	12.6	12.6	12.4
Sole Community Hospital	7.0	3.8	5.4	4.9
Rural Referral Center	10.2	15.9	16.3	19.8
Both SCH and RRC	9.9	7.4	7.9	8.4
Rural Hospitals 50 Beds	6.0	12.5	19.0	18.6

TABLE 2.1: ESTIMATED MEDICARE OPERATING MARGINS FOR THE FIRST YEAR OF PPS, A FULLY PHASED ON PPS BASED ON PRE-OBRA RATES, A FULLY PHASED PPS BASED ON REBASED RATES, AND A FULLY PHASED PPS BASED ON CURRENT LAW

	Medicare Operating Margins Under:			
	First Year of National Rates	Pre-OBRA System 100 Percent National Rates	Rebased System 100 Percent National Rates	Current System 100 Percent National Rates
National Average	16.4%	12.6%	12.6%	12.6%
Urban Hospitals	18.2	13.8	12.9	12.8
Rural Hospitals	8.6	6.7	11.2	11.9
Urban Hospitals by Region:				
New England	15.6	4.7	3.9	3.7
Middle Atlantic	20.7	18.7	17.7	17.5
South Atlantic	16.0	13.9	13.0	12.9
East North Central	18.2	8.7	7.8	7.6
East South Central	13.2	16.9	15.9	15.7
West North Central	22.5	17.6	16.7	16.5
West South Central	20.7	17.7	16.7	16.6
Mountain	19.8	15.9	15.0	14.9
Pacific	17.9	14.9	14.0	13.9
Rural Hospitals by Region:				
New England	8.2	1.6	4.2	5.9
Middle Atlantic	18.9	-3.9	0.4	2.6
South Atlantic	9.0	7.3	11.6	12.2
East North Central	9.1	3.3	7.7	8.0
East South Central	6.5	9.5	14.4	15.5
West North Central	8.7	7.2	12.2	12.8
West South Central	6.4	12.5	17.7	18.4
Mountain	6.5	8.7	12.3	12.3
Pacific	10.0	10.0	14.0	13.4

TABLE 2.2: ESTIMATED DISTRIBUTION OF HOSPITALS BY MEDICARE OPERATING MARGINS FOR THE FIRST YEAR OF PPS, A FULLY PHASED PPS BASED ON PRE-OBRA RATES, A FULLY PHASED PPS BASED ON REBASED RATES, AND A FULLY PHASED PPS BASED ON CURRENT LAW

	Percentage of Hospitals with:			
	Operating Margins Less than -20%	Operating Margins Between -20% & 0%	Operating Margins Between 0% & 20%	Operating Margins Greater than 20%
National Average				
First Year of PPS	3.0%	16.5%	53.4%	27.2%
Pre-OBRA System	4.8	22.1	37.2	35.9
Rebased System	3.8	19.5	36.8	39.9
Current System	3.8	19.5	37.0	39.7
Urban Hospitals				
First Year of PPS	1.4	8.3	53.2	37.1
Pre-OBRA System	3.2	17.8	38.1	40.9
Rebased System	3.3	20.0	37.6	39.2
Current System	3.2	19.8	37.6	39.4
Rural Hospitals				
First Year of PPS	4.5	24.3	53.5	17.8
Pre-OBRA System	6.6	26.5	36.3	30.7
Rebased System	4.4	18.9	36.1	40.6
Current System	4.4	19.2	36.4	40.1

TABLE 2.2: ESTIMATED DISTRIBUTION OF HOSPITALS BY MEDICARE OPERATING MARGINS FOR THE FIRST YEAR OF PPS, A FULLY PHASED PPS BASED ON PRE-OBRA RATES, A FULLY PHASED PPS BASED ON REBASED RATES, AND A FULLY PHASED PPS BASED ON CURRENT LAW

Urban Hospital Payment Groups

Percentage of Hospitals with:

REGION	Operating Margins Less than -20%	Operating Margins Between -20% & 0%	Operating Margins Between 0% & 20%	Operating Margins Greater than 20%
New England				
First Year of PPS	1.5%	8.7%	71.0%	18.9%
Pre-OBRA System	6.0	28.3	42.4	23.4
Rebased System	6.5	29.9	42.4	21.2
Current System	6.0	30.4	42.4	21.2
Middle Atlantic				
First Year of PPS	1.3	3.2	49.0	46.5
Pre-OBRA System	1.9	11.5	40.8	45.8
Rebased System	1.9	12.8	40.8	44.6
Current System	1.9	12.8	40.8	44.6
South Atlantic				
First Year of PPS	2.2	8.7	59.0	30.1
Pre-OBRA System	3.7	17.7	40.1	38.6
Rebased System	4.0	18.7	40.6	36.8
Current System	4.0	18.4	40.3	37.3
East North Central				
First Year of PPS	0.4	11.9	62.9	22.5
Pre-OBRA System	3.0	24.2	42.5	30.4
Rebased System	3.0	28.9	39.6	28.7
Current System	3.0	28.3	40.2	28.7
East South Central				
First Year of PPS	2.7	11.9	62.9	22.5
Pre-OBRA System	1.2	12.7	38.2	47.9
Rebased System	1.2	15.2	37.6	46.1
Current System	1.2	15.5	37.6	46.1

TABLE 2.2: ESTIMATED DISTRIBUTION OF HOSPITALS BY MEDICARE OPERATING MARGINS FOR THE FIRST YEAR OF PPS, A FULLY PHASED PPS BASED ON PRE-OBRA RATES, A FULLY PHASED PPS BASED ON REBASED RATES, AND A FULLY PHASED PPS BASED ON CURRENT LAW

Urban Hospital Payment Groups

Percentage of Hospitals with:

REGION	Operating Margins Less than -20%	Operating Margins Between -20% & 0%	Operating Margins Between 0% & 20%	Operating Margins Greater than 20%
West North Central				
First Year of PPS	1.2	6.0	46.7	46.1
Pre-OBRA System	1.0	15.2	34.5	49.2
Rebased System	1.0	17.8	34.5	46.7
Current System	1.0	17.8	33.5	47.7
West South Central				
First Year of PPS	1.3	8.2	45.7	44.8
Pre-OBRA System	2.4	14.9	33.9	48.8
Rebased System	2.4	16.3	34.7	46.6
Current System	2.4	16.0	35.0	46.6
Mountain				
First Year of PPS	2.3	10.2	37.5	50.0
Pre-OBRA System	6.0	12.0	44.0	38.0
Rebased System	6.0	12.0	44.0	38.0
Current System	6.0	12.0	44.0	38.0
Pacific				
First Year of PPS	1.4	9.0	51.4	38.3
Pre-OBRA System	4.2	17.7	31.9	46.2
Rebased System	4.4	19.7	31.3	44.6
Current System	4.4	19.5	31.3	44.8

TABLE 2.2: ESTIMATED DISTRIBUTION OF HOSPITALS BY MEDICARE OPERATING MARGINS FOR THE FIRST YEAR OF PPS, A FULLY PHASED PPS BASED ON PRE-OBRA RATES, A FULLY PHASED PPS BASED ON REBASED RATES, AND A FULLY PHASED PPS BASED ON CURRENT LAW

Rural Hospital Payment Groups

Percentage of Hospitals with:

REGION	Operating Margins Less than -20%	Operating Margins Between -20% & 0%	Operating Margins Between 0% & 20%	Operating Margins Greater than 20%
New England				
First Year of PPS	0.0%	16.2%	67.6%	16.2%
Pre-OBRA System	10.7	30.4	46.4	12.5
Rebased System	3.6	25.0	44.6	26.8
Current System	5.4	26.8	41.1	26.8
Middle Atlantic				
First Year of PPS	0.0	13.5	43.2	43.2
Pre-OBRA System	9.9	48.4	30.8	11.0
Rebased System	6.6	35.2	34.1	24.2
Current System	6.6	38.5	35.2	19.8
South Atlantic				
First Year of PPS	2.3	20.3	59.8	17.6
Pre-OBRA System	6.6	26.0	40.6	26.9
Rebased System	5.1	18.5	37.3	39.1
Current System	5.1	18.5	38.2	38.2
East North Central				
First Year of PPS	0.9	21.4	61.4	16.3
Pre-OBRA System	6.3	35.9	40.0	17.8
Rebased System	2.7	24.4	46.6	26.3
Current System	2.7	24.9	45.5	26.9
East South Central				
First Year of PPS	2.0	27.9	54.8	15.3
Pre-OBRA System	5.2	23.0	33.4	38.3
Rebased System	3.7	13.2	34.4	48.8
Current System	3.7	13.5	34.7	48.2

TABLE 2.2: ESTIMATED DISTRIBUTION OF HOSPITALS BY MEDICARE OPERATING MARGINS FOR THE FIRST YEAR OF PPS, A FULLY PHASED PPS BASED ON PRE-OBRA RATES, A FULLY PHASED PPS BASED ON REBASED RATES, AND A FULLY PHASED PPS BASED ON CURRENT LAW

Rural Hospital Payment Groups

Percentage of Hospitals with:

REGION	Operating Margins Less than -20%	Operating Margins Between -20% & 0%	Operating Margins Between 0% & 20%	Operating Margins Greater than 20%
West North Central				
First Year of PPS	4.5	23.8	52.6	19.1
Pre-OBRA System	5.0	21.1	37.4	36.4
Rebased System	4.0	14.3	33.4	48.3
Current System	3.9	15.1	33.1	48.0
West South Central				
First Year of PPS	10.5	28.2	44.1	17.2
Pre-OBRA System	7.1	22.6	33.9	36.5
Rebased System	3.8	19.3	31.0	46.0
Current System	3.8	19.3	31.9	45.1
Mountain				
First Year of PPS	6.9	25.9	49.1	18.1
Pre-OBRA System	8.6	25.4	32.8	33.2
Rebased System	7.0	20.0	35.6	37.5
Current System	6.6	18.8	37.1	37.5
Pacific				
First Year of PPS	5.2	25.9	52.6	16.3
Pre-OBRA System	7.9	31.7	32.3	28.1
Rebased System	6.7	22.6	36.0	34.8
Current System	6.7	20.7	37.8	34.8

(percentages may not add due to rounding)

Chapter 3

REFINING MEASURES OF HOSPITAL OUTPUT

One of the principal findings of Chapter 2 was that small hospitals, especially those with fewer than 100 beds, can be expected to have significantly higher Medicare operating margins than larger hospitals. This result applies to both urban and rural hospitals. Possible explanations of this result include the following:

- Some factor or factors related to hospital size have been omitted from the PPS payment formula.
- Large hospitals may be less efficient than small hospitals.

If factors that are important in explaining cost differences are omitted from the payment formula, the result will be a disparity between PPS payments and costs among hospitals. For example, if the higher observed costs of large hospitals (after adjusting for local wages, case mix, indirect teaching effects, and the effects of serving a disproportionate share of low income patients) are the result of differences in hospital output not currently reflected in the DRG-based case mix index, then further refinements to the case mix measure are warranted. If the observed cost differential is the result of imperfectly measured input costs, then further refinements to the HCFA wage index and nonlabor input price adjustments used in the PPS are indicated.

Sufficient refinements to the output and input price measures currently used in the PPS may eliminate or reduce the need for separate urban and rural rates. It may also reduce the need for the indirect medical education and the disproportionate share adjustments. As indicated in Chapter 2, all of these compensatory elements of the PPS are imperfect corrections that tend to overcompensate one group of hospitals at the expense of other hospitals in the system.

This chapter examines the need for refinements to the case mix measure used in PPS. The discussion reports the findings of studies that have investigated the underlying sources of variations in hospital costs within DRG, and provides some insight into the urban-rural and bedsize cost differentials that remain after adjusting for a DRG-based case mix index, local area wages, indirect teaching effects, and the effects of serving a disproportionate share of low income patients. Finally, a discussion of potential refinements to the current case mix measure is presented.

RESEARCH ISSUES CONCERNING OUTPUT ADJUSTMENTS

Under PPS, the Federal prospective payment rate is adjusted for differences in the mix of cases treated between hospitals. This adjustment is made using a patient classification system called diagnosis-related groups (DRG's) that was developed at Yale University. In the DRG system, patients are grouped into 472 categories derived from a multistage process of clinical judgement and statistical analysis. The DRG system is designed for use with diagnosis and procedure information coded in the International Classification of Diseases, 9th Revision,

Clinical Modification (ICD-9-CM) coding system. The actual payment a hospital receives for a given patient is determined by multiplying the Federal payment rate by a weight appropriate to that discharge. The DRG relative weights are estimates of the relative resource intensity of each DRG. These weights are computed by estimating the average resource intensity per case for each DRG, and dividing each of those values by the average resource intensity per case for all DRG's.

In studying hospital costs, the method of defining output is very important. PPS defines hospital output by the number of discharges in 472 diagnosis related groups. However, differentiating discharges by this method is not sufficient to fully capture all dimensions of hospital output. At the most basic level, hospital costs are incurred by the production of specific services. Blood tests are run, surgical procedures are performed, meals are served, laundry is washed, x-rays are taken, and so forth. A hospital's service outputs can only be approximated by its number of discharges classified by diagnosis related groups. Two types of potential variation among hospitals are not taken into account in this output measure:

- Within-DRG differences in patient's resource requirements
- Within-DRG differences in physician and hospital treatment patterns

The critical question in determining whether the imprecision in the measurement of hospital output results in payment inequities is whether systematic differences in resource requirements and/or treatment patterns exist across hospitals. In the PPS, payment for each DRG is based on the average relative resource intensity of similar cases across the country. If certain hospitals treat patients with higher or lower resource

requirements than the national average, then payment-cost disparities may result. Similarly, if certain hospitals treat patients with greater or lesser intensity of care than the national average, then payment-cost disparities may result.

The next section describes the findings of studies which suggest that differences in physician and hospital treatment patterns are important in explaining urban-rural and bedsize differences in hospital costs. Differences in patient resource requirements, often regarded as "severity" differences, are explored, but a detailed examination of this issue is beyond the scope of this report. Also omitted from this report is a discussion of the relationship between differences in treatment patterns, patient resource requirements, and patient outcomes. These issues are addressed in another Report to Congress, recently prepared by the Department, entitled "DRG Refinement: Outliers, Severity of Illness, and Intensity of Care."

SOURCES OF URBAN-RURAL AND BEDSIZE COST DIFFERENCES

Certain hospitals treat a mix of patients that differs from the patient mix of other facilities, even within the same or similar catchment area. Hospitals may provide diagnostic or therapeutic services that are unavailable in other facilities, or may accept patients in certain medical and financial conditions that other hospitals would not.. In addition, patients with a given diagnosis may not have the same treatment requirements in certain types of hospitals as patients with that same diagnosis in other types of hospitals. All of these reasons combine to result in differential assignment of more costly cases to certain hospitals.

Garber, Fuchs, and Silverman (1986) examined this issue by comparing patients who were admitted to the faculty services and community services of a major university-affiliated hospital. The mix of patients admitted to the faculty service differed in several important respects from the patients admitted to the community service. The faculty service had more patients with costly diagnosis (based on the relative weights of the DRG to which the diagnoses were assigned), and also incurred substantially higher costs per case. Their study found that adjustment for case mix complexity eliminated much of the cost differential between faculty and community services in this hospital. However, within-DRG cost differentials still remained, which were attributed to more extensive use of diagnostic procedures and more intensive care provided in the faculty service. The higher costs in the faculty service were also accompanied by lower hospital mortality, although the authors could not conclude with certainty that the agressive treatment by the faculty service contributed to the lower mortality. As a result, it was not possible to determine whether the higher within-DRG costs incurred in this facility could be attributed to differences in severity of illness of patients with the same diagnosis, or to differences in practice styles and patient outcomes across inpatient facilities.

Cromwell, Hendricks, and Pope (1986) conducted an analysis to examine the source of within-DRG cost differences across different types of hospitals, with particular emphasis on differences between urban and rural hospitals, and hospitals of different size. Their primary interest was to determine how much of the observed urban-rural and bedsize cost differential within-DRG is due to severity of illness of patients with

the same diagnosis versus differences in practice styles. (Patient outcomes could not be assessed with the data available for the study.) The primary data base for this analysis was the pooled 1982 hospital and physician claims files in four states: Michigan, New Jersey, North Carolina, and Washington. These states were chosen to represent each of the major geographic regions. Hospital admissions were classified into DRGs, and physician (Part B) bills were then merged on at the patient stay level to provide detail on the kind of care received. The medical conditions for this analysis included four groups of related DRGs. Each cluster of DRGs represents an important Medicare problem, translating into a large number of cases for analysis. In addition, the set of four DRG clusters reflected a range of service needs that should highlight differences in practice styles in different institutional settings. The four clusters of DRGs included:

(1) Cerebrovascular Disease (DRGs 5, 14, 15, 16,17);

(2) Coronary Artery Disease (DRGs 106, 107 125, 132, 133, 140, 143);

(3) Pneumonia (DRGs 79, 80, 81, 89, 90, 91); and

(4) Prostatic Disease (DRGs 306, 307, 336, 337, 346, 347, 348, 349).

Results from the four-state sample indicated that per admission cost differences between urban and rural hospitals vary by as much as 50 percent depending on illness, even after adjusting for area wage levels. Prostate cases were 7 percent more expensive in urban areas while cardiac cases were 50 percent more so, wage adjusted. Consequently, the relative contribution of identified sources of variation is not the same by illness. Some generalizations can be made, nonetheless, and are summarized below.

First, adjusting costs for differences in local area wages is clearly important in explaining cost variation, with roughly one-third of the nominal urban-rural difference attributable to this factor. (For prostate cases, it explained two-thirds of the gap.)

The mix of cases by DRG is of far lesser significance, but important. Approximately 10-15 percent of the observed cost gap can be explained by DRG casemix. Among cardiac patients, DRG casemix explains over one-third of the cost difference due almost exclusively to the higher bypass surgery rate in urban areas. Only 1-in-142 rural cardiac patients receive heart bypasses versus 1-in-8 in large core-city hospitals. DRG casemix differences proved to be quite minor between urban and rural hospitals for prostate and pneumonia, suggesting either that casemix differences, in reality, are not all that great across urban and rural areas or that other-than-DRG casemix measures are necessary to capture true differences.

Many additional severity indicators were tried, including the patient's age, whether the patient died in the hospital, and an extensive set of illness staging measures, but the entire set did not contribute materially to the urban-rural cost differences within-DRG, typically one percent or less. Urban cases possess a slightly higher proportion of complex diagnoses, are slightly older, and are slightly more likely to die in the hospital than rural cases. These results suggest that urban cases may be more severly ill than rural cases, but the casemix and severity measures used in this analysis failed to yield marked differences between the two groups. If a major difference in casemix severity exists across urban and rural hospitals as a whole, this study was unable to document it with the broad set of measures readily available from claims data.

What is actually done to each patient is obviously a critical determinant of cost. The most striking finding of this study is that urban cases receive far more services and procedures than their rural counterparts. The mix of procedures in urban hospitals also appears somewhat more sophisticated and expensive. Whether ancillary intensity differences within-DRG are systematically different in urban and rural areas was generally undocumented before this study. According to the estimates of this study, differences in diagnostic and therapeutic procedures provided patients in rural versus urban hospitals explained 25-50 percent of the inter-area cost difference (with the exception of prostate where they were trivial). Stroke patients, for example, were over twice as likely to receive a head CAT scan, thoracic aortography, cerebroangiography, echocardiography, and EEGs in urban hospitals. These are procedural differences that cannot be attributed to DRG mix or to any of the other severity indicators included in the analysis. Further examination of these differences in services and procedures indicated that as much as three quarters of the ancillary intensity difference across urban and rural areas is attributable to the disproportionate number of large, often teaching, hospitals operating in urban areas.

Similar analyses that distinguished core-city from suburban-ring hospitals in the same MSA demonstrated that the former are often 10 percent more expensive, even after adjusting for wages, casemix, and other hospital characteristics such as teaching status and bedsize. Adjusting for procedure mix did have a limited impact on the within-urban cost differentials, reflecting the higher intensity of care of large, inner city, teaching institutions. Core city hospitals were also found

to have a disproportionately more expensive DRG mix, which PPS naturally adjusts for, while suburban hospitals looked much more like rural hospitals in terms of casemix.

In summary, there is very little evidence to indicate that, after controlling for differences in area wages and DRG case mix, urban-rural cost differences are attributable to a gross error in the measurement of casemix severity. Better measures may reduce the standardized cost differences slightly; however, procedure mix differences explain a much larger amount of the standardized cost gap. Physicians in urban hospitals practice a more technology-intensive style of practice that is unexplained by the mix of cases by DRG or severity of illness. Also, there is a strong correlation between procedure intensity and the size of the hospital, and between procedure intensity and teaching orientation. Physicians in large, teaching hospitals simply do more to diagnose and treat patients, an orientation likely fostered by a densely concentrated population able to support a wide range of services. While the outcomes associated with this greater activity are unknown, and the marginal value of it may often be low, it appears that urban hospitals, which tend to be larger and more likely to engage in teaching activities, are providing more services for the extra cost and not simply paying unnecessarily high wages or other input prices, or producing services inefficiently.

POTENTIAL REFINEMENTS

The findings presented above have important implications for future refinements of the PPS payment formula. Evidence strongly suggests that systematic differences in practice intensity exist and have a significant

effect on the PPS urban and rural payment rates. However, given the interrelationship between urban-rural location and hospital size, the results of Chapter 2 suggest that separate urban and rural payment rates may not be the best way of adjusting for these differences.

A gross urban-rural rate distinction should reflect interhospital differences that are systematically related to geographic location. Although a 20 percent difference in standardized costs between urban and rural costs exists (Table 1, p. 42232, Federal Register, November 24, 1986), separate urban and rural rates effectively label all rural hospitals (with the exception of rural referral centers) as "low cost" and all urban hospitals as "high cost". However, the 20 percent cost differential is due primarily to a style of practice which relates much more closely to hospital size, service mix, and teaching status. Possible refinements to the current method of adjusting for practice intensity differences (i.e., separate urban and rural rates) are presented below.

Elimination of Separate Urban and Rural Rates

As indicated in Table 3.1, simply eliminating the urban-rural rate differential would not be appropriate, since it would generate windfall gains or losses based primarily on systematic differences in practice intensity. One national rate implies one national norm of care. However, an argument can be made for retaining differences in practice styles on behalf of those hospitals practicing state-of-the-art medicine to the extent they afford access to agressive care in all parts of the nation.

TABLE 3.1: ESTIMATED MEDICARE OPERATING MARGINS FOR A BASELINE FULLY PHASED-IN PPS VERSUS A PPS WITH A SINGLE NATIONAL RATE

	Medicare Operating Margins Under:	
	Current System Separate Urban and Rural National Rates	Current System Single National Rate
National Average	12.6%	12.6%
Urban Hospitals	12.8	10.6
Rural Hospitals	11.9	22.1
Urban Hospitals by Bedsize:		
0- 99 Beds	17.9	15.7
100-404 Beds	11.9	9.8
405-684 Beds	13.0	10.9
685 + Beds	14.1	12.0
Rural Hospitals by Bedsize:		
0- 99 Beds	14.5	30.3
100-169 Beds	8.4	18.4
170 + Beds	11.3	13.6
Teaching Status:		
Nonteaching Hospitals	12.2	13.9
Resident/Bed .25	12.5	10.5
Resident/Bed .25	15.3	13.2
Disproportionate Share Status:		
Non DSH Hospitals	11.2	12.0
DSH Urban 100 Beds	15.4	13.2
DSH Urban 100 Beds	22.1	19.8
DSH Rural Hospitals	24.0	40.3
Other Special Status:		
No Special Status	12.4	12.5
Sole Community Hospital	4.9	7.4
Rural Referral Center	19.8	17.2
Both SCH and RRC	8.4	7.6
Rural Hospitals 50 Beds	18.6	34.7

The simulation results reported in column two assume that all hospitals were reimbursed on the basis of a single national rate computed in the same manner as the dual rate system with the exception that the base year cost per case data from individual hospitals were inflated and grouped into a single national rate. Total payments were constrained to be equal under each system.

Consider the dynamics of one national PPS rate with systematically different practice styles and service mixes across hospitals. Windfall gains would be incurred by small hospitals everywhere, but particularly so in rural areas. What would small rural hospitals do with these gains in Medicare payments? One option would be to subsidize losses elsewhere due to low occupancy rates. Another option would be to acquire the technologies and expertise needed to provide a wider array of services, and to adopt the practice patterns of large, teaching hospitals practicing state-of-the-art medicine.

Currently, smaller rural (and urban) hospitals provide a wide variety of less intensive, effective care for most patients in many DRGs. It is not clear that they should be encouraged by windfall gains to increase the scale and scope of services they provide, or to adopt the more agressive medical practice patterns of large, urban teaching facilities. A more appropriate set of incentives to the hospital industry might be to encourage the concentration of expensive technologies in larger institutions that could cover their high fixed costs over a larger patient population, and to encourage triaging patients to the hospital providing the most cost-effective care.

Additional Continuous Payment Adjustors

Instead of either a single national rate or separate urban and rural rates, a more appropriate solution might be to implement an additional continuous payment variable or variables (to supplement the current case mix index) that could be used to adjust a single national rate. Such an adjustor would, in effect, adjust for the observed urban-rural and bedsize cost differences, but in a more graduated fashion, and in a

manner more closely related to the underlying sources of the urban-rural and bedsize cost differences. Research is currently underway to construct a measure more closely related to the underlying sources of the observed standardized cost differences. One promising approach is based on hospital referral patterns.

Bobula and Jencks (1986) conducted an analysis of hospital transfers and referrals, and the impact of such activity on hospital cost per case. The data used to conduct the analysis were constructed from the 1984 and 1985 MEDPAR files and the 1984 Medicare Cost Report file which permitted identification of hospital transfer and referral patterns by type of facility and an evaluation of the relationship between transfer and referral activity and hospital cost per case. They defined a transfer admission as an admission to a hospital which occurred on the same day as a discharge from another hospital. The number and percent of transfers into and out of a given hospital were identified by linking all Medicare discharges during Federal fiscal years 1984 and 1985 according to patient health insurance code number and identifying as transfers all admissions which occurred on the same day the patient was discharged from another hospital. This permitted the construction of a hospital transfer index defined as follows:

$$\frac{\text{Number of transfers received - Number of transfers sent}}{\text{Total number of Medicare admissions}}$$

Referred patients were defined as those who sought care at hospitals which do not generally serve their areas. To create a referral index, they used a file which identified the number of Medicare admissions from each zip code in the country to each hospital in the country for Federal fiscal year 1985. For each zip code they calculated the number of

admissions from that zip code to hospitals other than the one to which the patient was admitted. They likewise calculated the total number of admissions to all hospitals from the zip code. A given patient's referral index is then:

$$\frac{\text{Admissions from patient's zip to hospitals other than that used by patient}}{\text{Admissions from patient's zip to all hospitals}}$$

A hospital's referral index was defined as the average patient referral index for all Medicare admissions to the hospital.

Simple correlations between hospital average Medicare cost per case and the transfer and referral indexes indicated that both the transfer index and the referral index correlate strongly with hospital cost per case. Both indexes also correlated strongly with high case mix index, high wage index, large hospital size, high teaching intensity and urban location. Multivariate regression analysis was also performed in which the hospital's average Medicare cost per case was regressed separately and combined on the transfer index and the referral index while controlling in each regression for case mix differences, wage differences, teaching intensity, disproportionate share status, and urban-rural location.

The analysis supported the hypothesis that transfer and referral activity is a significant factor explaining variation in average Medicare cost per case among hospitals. The use of either measure in a hospital cost equation captured effects not accounted for by the output and input price measures used in previous studies. Hospitals that received more cases on either a transfer or a referral basis (typically large, urban hospitals) had higher costs per case than hospitals that transferred or

referred more cases to other hospitals (typically small, rural hospitals), after accounting for differences in area wages, casemix, extent of teaching, disproportionate share status, and urban-rural location.

Additional work by Jencks and Bobula (1987) at the individual patient level showed that the relation of the transfer and referral indices to the hospital average cost per case is not a simple result of the greater costliness of transferred and referred patients. For transfer cases, the increased charges of transfer patients accounted for roughly one third of the increased costs of hospitals receiving transfers. For referred cases, there was almost no increase in charges that could explain the large increase in hospital average cost per admission.

The authors offered two possible explanations for these findings. First, if hospitals which receive more transfers and referrals have higher admission thresholds in general (i.e., these hospitals do not admit patients with mild illness), then they will also have higher average levels of severity or intensity for all of their patients. Hence, the higher observed costs in these hospitals are the result of higher admission thresholds rather than the larger number of transferred and referred patients. A second explanation would be that hospitals which receive more transfers and referrals, most of which appear to be tertiary care hospitals, use their special capabilities and skills not only for patients with that are transferred and referred with critical illnesses and exotic disorders, but also for the rest of their patients.

In either case, an argument could be made for adjusting the payments received by a hospital for the level of transfer of referral activity incurred by that facility. These variables correlate strongly with the

higher costs of large, urban teaching hospitals, costs which result either from the increased care needs of patients in these facilities or from the more costly services which these hospitals provide as perceived centers of excellence. At a minimum, the findings of these studies demonstrate that potential continuous adjustors exist that do a better job of explaining costs than a simple urban-rural distinction, and in a manner more closely related to the underlying sources of the cost differences between urban and rural hospitals and hospitals of different size. Further research into these and other potential continuous payment adjustment variables should result in a feasible alternative to the current urban-rural rate differential.

Potential Impact of a Payment System with Adjustments for Transfer Activity

In order to present a preliminary investigation of the potential effects of a payment system based on a single national rate and an additional continuous adjustment factor, a simulation was conducted using the hospital transfer index described in the previous section. The calculation of standardized payment amounts for this system proceeded as described below.

The rates use the same base year estimates of each hospital's average operating cost per case as were used in the first step of the computation of the published FY 1987 standardized payment amounts. In the second step, each hospital's estimated operating cost per case was adjusted for variations in hospital wage levels, case mix severity, indirect medical education costs, disproportionate share of low income patients, and

transfer activity. The transfer adjustment factor* used to standardize Medicare cost per case was derived from multivariate regression analysis of hospitals' operating costs per discharge (see Bobula and Jencks, 1986). The transfer adjustment factor is a continuous adjustor used in the standardization process that was not previously available for this purpose. Finally, adjusted cost per case data from individual hospitals were inflated to FY 1987 and grouped into a single national rate. The simulation assumes that all hospitals were reimbursed on the basis of this single national rate beginning October 1, 1987. The same transfer adjustment factor used in standardization was used in making payments to hospitals with transfer activity. Outlier payments were simulated using the proposed FY 1987 outlier criteria and allocated to the appropriate hospitals. No special treatment was provided for rural referral centers under this payment option, since there is no distinction between urban and rural national rates.

The second column of Table 3.2 presents the simulation results of a single rate prospective payment system with adjustments for transfer activity. The findings indicate that such a system would substantially affect the average operating margins for different categories of hospitals. Under a single rate system with adjustments for transfers, rural hospitals would fare substantially better than urban hospitals. However, the disparity between urban and rural hospitals under a single

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The transfer adjustment factor was estimated to be:

$$((1 + \text{ratio of transfers received to total cases} - \text{ratio of transfers sent to total cases})^{1.6} - 1).$$

TABLE 3.2: ESTIMATED MEDICARE OPERATING MARGINS FOR A BASELINE FULLY PHASED-IN PPS VERSUS A PPS WITH ADJUSTMENTS FOR TRANSFER ACTIVITY

	Medicare Operating Margins Under:		
	Current System 100 Percent National Rates	Transfer Adjusted Single National Rate	Current System Single National Rate
National Average	12.6%	12.6%	12.6%
Urban Hospitals	12.8	11.5	10.6
Rural Hospitals	11.9	18.0	22.1
Urban Hospitals by Bedsize:			
0- 99 Beds	17.9	10.9	15.7
100-404 Beds	11.9	9.6	9.8
405-684 Beds	13.0	13.9	10.9
685 + Beds	14.1	15.8	12.0
Rural Hospitals by Bedsize:			
0- 99 Beds	14.5	23.0	30.3
100-169 Beds	8.4	14.9	18.4
170 + Beds	11.3	13.6	13.6
Teaching Status:			
Nonteaching Hospitals	12.2	11.9	13.9
Resident/Bed .25	12.5	12.5	10.5
Resident/Bed .25	15.3	16.8	13.2
Disproportionate Share Status:			
Non DSH Hospitals	11.2	11.5	12.0
DSH Urban 100 Beds	15.4	14.6	13.2
DSH Urban 100 Beds	22.1	15.1	19.8
DSH Rural Hospitals	24.0	32.1	40.3
Other Special Status:			
No Special Status	12.4	12.5	12.5
Sole Community Hospital	4.9	6.1	7.4
Rural Referral Center	19.8	17.4	17.2
Both SCH and RRC	8.4	7.3	7.6
Rural Hospitals 50 Beds	18.6	26.0	34.7

rate system with adjustments for transfers is substantially diminished compared to a single rate system that does not include adjustments for referral activity (See column 3 of Table 3.2.).

The finding that rural hospitals would continue to fare relatively better than their urban counterparts even under a single rate PPS system with adjustments for transfers indicates that the transfer measure does not completely account for all of the remaining differences in costs between urban and rural hospitals, after adjusting for wages, case mix, teaching activity, and disproportionate share status. However, implementing an additional continuous payment variable — in this case an adjustment for transfer activity -- to adjust a single national rate mitigates the result of a single rate system with no adjustment for transfer activity to generate windfall gains to rural hosptitals. In addition, bed size differences are substantially altered under a single rate system with referral adjustments. Under both a fully phased-in version of the current system, or a single rate system with no other modifications to the current system, small urban and small rural hospitals are estimated to fare better than than larger counterparts. Use of a single rate system with adjustments for transfer activity would diminish or reverse this disparity.

Notice also that large urban hospitals and hospitals with extensive teaching activity would fare better under a single rate system with adjustments for transfer activity than they would under either a dual rate system or a single rate system with no other refinements. These results are not surprising since these categories of hospitals are more likely to receive a disproportionate number of transfer cases (see Bobula

and Jencks, 1986). They also demonstrate that less reliance on compensatory factors such as the indirect medical education and disproportionate share adjustments would be required under such a system.

Rural referral centers are estimated to fare relatively well under a fully phased-in version of the current system since they receive the urban rather than rural payment rate under the Medicare prospective payment system. They are also estimated to fare relatively well under a single rate version of the current system due to the bias in favor of rural hospitals inherent in a single rate system. Replacing the current rural referral policy with use of a single rate system with adjustments for referral activity would result in lower operating margins for rural referral centers (17.4 percent versus 19.8 percent expected under the current payment system).

The distribution of hospitals by Medicare operating margins under a dual rate system, a single rate system, and a single rate system with adjustments for transfers is reported in Table 3.3. These results further support the findings of Table 3.2. Use of a single rate with adjustments for transfers reduces the disparity between urban and rural hospitals with respect to the percentage of hospitals with expected margins exceeding 20 percent relative to a single rate system with no adjustment for referrals. A similar reduction in the disparity across bedsize categories is observed relative to both a dual rate system and a single rate system with no adjustment for transfer activity.

While a single rate system with adjustments for transfers offers some advantages over either the current dual rate system or a single rate system with no other refinements, it is not the final answer to the issue of preserving or eliminating the urban-rural rate differential, at least

TABLE 3.3: ESTIMATED DISTRIBUTION OF HOSPITALS BY MEDICARE OPERATING MARGINS FOR A BASELINE FULLY PHASED-IN PPS VERSUS A PPS WITH ADJUSTMENTS FOR REFERRAL ACTIVITY

	Percentage of Hospitals with:			
	Operating Margins Less than -20%	Operating Margins Between -20% & 0%	Operating Margins Between 0% & 20%	Operating Margins Greater than 20%
National Average				
Baseline FY 88	3.8%	19.5%	36.8%	39.9%
Referral System	3.9	18.6	34.1	43.4
Single Rate System	2.9	16.0	32.3	48.8
Urban Hospitals				
Baseline FY 88	3.3	20.0	37.5	39.2
Referral System	4.9	24.1	36.6	34.4
Single Rate System	3.9	22.7	37.7	35.7
Rural Hospitals				
Baseline FY 88	4.4	18.9	36.1	40.6
Referral System	2.7	12.9	31.6	52.8
Single Rate System	1.9	9.1	26.6	62.4
Teaching Status				
Nonteaching:				
Baseline FY 88	4.2	19.2	36.0	40.6
Referral System	4.0	18.0	33.0	45.0
Single Rate System	2.9	14.6	30.6	51.9
Resident/Bed 0.25:				
Baseline FY 88	2.4	21.4	41.7	34.5
Referral System	3.3	22.5	40.5	33.7
Single Rate System	3.1	23.5	41.1	32.3
Resident/Bed 0.25:				
Baseline FY 88	1.8	16.6	34.9	46.7
Referral System	1.8	16.6	32.5	49.1
Single Rate System	1.8	18.3	34.9	45.0

TABLE 3.3: ESTIMATED DISTRIBUTION OF HOSPITALS BY MEDICARE OPERATING MARGINS FOR A BASELINE FULLY PHASED-IN PPS VERSUS A PPS WITH ADJUSTMENTS FOR REFERRAL ACTIVITY

	Percentage of Hospitals with:			
	Operating Margins Less than -20%	Operating Margins Between -20% & 0%	Operating Margins Between 0% & 20%	Operating Margins Greater than 20%
Urban Hospitals				
00 - 99 Beds:				
Baseline FY 88	6.2%	15.7%	28.1%	50.0%
Referral System	8.1	22.1	28.6	41.1
Single Rate System	6.5	17.7	28.1	47.7
100-404 Beds:				
Baseline FY 88	2.8	21.8	40.2	35.2
Referral System	4.6	25.7	39.2	30.5
Single Rate System	3.6	24.6	40.5	31.3
405-684 Beds:				
Baseline FY 88	0.3	20.4	42.7	36.6
Referral System	0.9	20.7	40.0	38.4
Single Rate System	0.9	24.0	42.7	32.4
685 + Beds:				
Baseline FY 88	0.0	19.2	42.5	38.3
Referral System	0.0	20.6	37.0	42.5
Single Rate System	0.0	21.9	43.8	34.3
Rural Hospitals				
01 - 99 Beds:				
Baseline FY 88	4.5	17.3	34.3	43.9
Referral System	3.1	12.3	27.9	56.7
Single Rate System	2.1	8.3	21.7	67.9
100-169 Beds:				
Baseline FY 88	4.8	27.3	39.8	28.1
Referral System	1.5	14.8	42.1	41.6
Single Rate System	1.2	11.0	38.9	48.9
170 + Beds:				
Baseline FY 88	3.5	19.2	46.0	31.3
Referral System	1.0	15.2	49.0	34.8
Single Rate System	1.0	13.2	52.5	33.3

in its present form. One major problem with the transfer measure used in this analysis is that it understates true referral activities since it cannot capture referrals made directly by physicians, emergency rooms, or other agencies for which there are not two hospital admissions. Nevertheless, the findings reported above demonstrate that it may be possible in the future to address the issue of payment-cost disparities between urban and rural hospitals and hospitals of different size while at the same time eliminating or reducing the need for separate urban and rural rates, and the need for the indirect teaching adjustment factor and the disproportionate share adjustment factor currently in use.

SUMMARY

This chapter reported the results of analyses that examined the reasons for hospital cost differences across urban and rural areas, and across hospitals of different size. The underlying sources of the observed cost differences are critical to the refinement of PPS. If the cost differences are the result of genuine case mix or severity differences not currently reflected in the case mix index, then further refinements of the PPS case mix measure are required. If, on the other hand, they are the result of systematic differences in efficiency, this would clearly not be a justifiable source of higher costs.

With respect to case mix refinements, there was very little evidence to indicate that, after controlling for differences in area wages and DRG case mix, urban-rural cost differences are attributable to a gross error in the measurement of casemix severity. Better measures may reduce the standardized cost differences slightly; however, procedure mix

of practice that is unexplained by the mix of cases by DRG or severity of illness. Also, there is a strong correlation between procedure intensity and the size of the hospital, and between procedure intensity and teaching orientation. Physicians in large, teaching hospitals simply do more to diagnose and treat patients, an orientation likely fostered by a densely concentrated population able to support a wide range of services.

The results of this analysis have important implications for the refinement of the PPS payment system. Separate urban and rural rates effectively labels all rural hospitals (with the exception of rural referral centers) as "low cost" and all urban hospitals as "high cost".However, the cost differential is due primarily to a style of practice which relates much more closely to hospital size, service mix, and teaching status.

A more appropriate solution to the current urban-rural rate differential would be to implement an additional continuous payment variable (like the wage index or case mix index) that could be used to adjust a single national rate. Such an adjustor might adjust for the observed urban-rural and bedsize cost differences in a more graduated manner that is more closely related to the underlying sources of the cost differences among hospitals. As a result, the need for other compensatory elements, such as rural referral centers and the indirect medical and disproportionate share adjustments, might be significantly reduced. This chapter presented some preliminary work that attempts to develop such an adjustor.

Regional differences were not discussed in this chapter, because the refined output measures examined do not hold any promise for addressing the regional variation described in Chapter 2. Consideration of regional issues is deferred to Chapter 5.

CHAPTER 4

REFINING INPUT PRICE MEASURES

This chapter reports the results of analyses that examined whether disparities between PPS payments and costs might be the result of imperfectly measured input prices. The first issue examined below concerns the definition of labor market areas used in computing the wage index, and whether the wage index should recognize wage differentials within labor markets that are locational in nature. The second issue examined concerns the possibility of extending the nonlabor-related input price adjustment to cover price variations within the 48 contiguous states and the District of Columbia. The final section reports the findings of a study of the variation in the proportions of labor-related costs among DRG's and the effect of assuming a constant labor-related cost share for all DRG's in applying the PPS wage index adjustment.

Under PPS, the labor-related portion of the Federal prospective payment rate is adjusted for differences in wages and fringe benefits between areas. This adjustment is made using an area wage index defined for 363 urban and rural labor markets. The area wage index, which reflects total labor compensation including fringe benefits, was refined effective with the implementation of the FY 1986 PPS final rule (Federal Register, 1985) by changing its basis from compensation per employee (Bureau of Labor Statistics data) to compensation per hour (1982 HCFA

Wage Survey). This refinement was made to more accurately account for differences in the use of part-time employees. The analysis supporting this change was submitted to the Congress in the 1985 "Report on Hospital Wage Index Required by Section 2316(a) of Public Law 98-369." PPS only adjusts for nonlabor-related costs in the case of Alaska and Hawaii hospitals, based on a cost of living index.

RESEARCH ISSUES CONCERNING LABOR INPUT PRICE ADJUSTMENTS

Ideally, well-defined labor market areas would form the basis for the wage index. Each hospital's wage index would reflect the level of relative wages within its own labor market. Unfortunately, no one knows how to define these ideal labor markets. As a result, it is necessary to approximate the ideal labor markets based on imprecise knowledge and limited data. Currently, each Metropolitan Statistical Area (MSA) is assumed to be a distinct urban labor market, and all counties within the same State that are outside of MSAs are assumed to comprise a single rural labor market. Hence, all hospitals in the same metropolitan statistical area (MSA) are defined as being in the same urban wage index area and, as a result, have the same wage index value. Similarly, all hospitals in the same State, but not in an MSA, are in the same rural wage index area and have the same wage index value.

Rural hospitals near MSAs assert that their wages are higher than those of rural hospitals farther from MSAs, because they must pay wages that are competitive with those of urban hospitals. Otherwise, their workers would commute to nearby urban hospitals. Also, they may need to attract workers who live in nearby urban areas. According to this reasoning, hospitals adjacent to MSAs are penalized under PPS by the use

of a wage index based on state-wide rural average wage values. A similar argument is made by core city hospitals, who assert that their wages are higher than those of suburban hospitals because urban workers have to be compensated for higher crime in the inner city, higher parking costs, etc. (Ashby, 1984).

There are several problems associated with the current definition of wage index areas. First, there is the problem of accurately delineating labor market areas. The current definition uses MSA boundaries as labor market boundaries. Commuting patterns are taken into account in deciding which outlying counties to include in an MSA, and there is no obvious flaw in the definition of MSAs that would suggest they are poor approximations of urban labor markets. (The detailed criteria used in defining MSAs were published in the January 3, 1980 Federal Register, Part 6.) However, as is the case anytime that discrete boundaries must be drawn, imprecision can result. The population cutoff points may be a source of this type of problem. (Each MSA must contain a city with a population of at least 50,000, and the MSA population must be at least 100,000.) There are urban areas that do not meet these criteria that currently are treated as part of the State-wide rural labor market. Examples include Grand Junction, Colorado; Quincy, Illinois; Bangor, Maine; and Missoula, Montana.

The use of a single State-wide rural labor market risks combining some small urban labor markets with rural labor markets, as in the examples above. In addition, it also risks combining multiple rural labor markets that might more appropriately be considered as peripheral areas of large urban labor markets. For example, most of the non-MSA

counties of Maryland might be considered peripheral areas of either Baltimore or Washington, D.C.

The system of economic areas devised by the Bureau of Economic Analysis of the U.S. Department of Commerce is the primary alternative to the MSA system as a potential basis for defining labor markets. Like MSAs, BEA Economic Areas (BEAs) consist of a center of economic activity, often an MSA, and the surrounding counties that are economically related to the center. To the extent possible, each area includes the place-of-work and place-of-residence of its labor force.

BEAs differ from MSAs in several ways. First, all counties in the country are assigned to one of 183 BEAs. The BEAs are, therefore, mutually exclusive and exhaustive. There are no areas such as non-MSA counties that are not linked to a center of economic activity. Journey-to-work information from the 1970 Census of Population was used to assign counties outside the center of a BEA. In many instances, the association between a county and a particular area was not based on direct commuting ties to the central city or county, but rather on commuting ties to a noncentral county, which, in turn, was tied to the center. This characteristic may mean that BEAs would be a better way of defining rural labor markets than the current single statewide area. BEAs would at least partially address the concerns of hospitals in rural counties that are adjacent to MSAs. These hospitals argue that they must compete for workers in the same labor market as their neighbor hospitals in adjacent MSA counties.

Second, the BEAs often have more than one MSA center. Multi-MSA centers were defined where MSAs were thought to be an integral part of a larger metropolitan complex. New York, Los Angeles, and Chicago are

obvious examples. However, there are many less obvious examples: the Detroit BEA includes the Detroit, Ann Arbor, and Flint MSAs; the New Orleans BEA includes the Biloxi-Gulfport, Mississippi MSA as well as the New Orleans MSA; and the Pittsburgh BEA includes the Altoona, Johnstown, and Pittsburgh MSAs. Third, in areas of the country with no MSAs, cities with populations of at least 25,000 that function as economic nodes were identified as area centers. BEAs that contain more than one MSA may provide a less precise approximation of the appropriate urban labor market than would use of the MSAs.

In addition to the problem of defining labor markets accurately, there is a related question whether, within labor markets, the wage index should recognize wage differentials that are locational in nature. Underlying this issue is the hypothesis that, other things equal, wage levels are inversely related to distance from the center of urban areas. Several economic studies of wages in sectors other than health care provide support for the hypothesis (Eberts, 1981; Ehrenberg and Goldstein, 1975; and Wachter, 1972). The basic explanation for the observed wage gradient is hypothesized to be the trade-off between commuting costs and wages. The basis for the hypothesis is that employment is concentrated in urban core areas, whereas workers' residences are spread over a much larger urban area. While some core-city residents commute to suburban areas to work, the net effect is an increase in core-cities' daytime population compared to resident population. For example, the Bureau of the Census estimates that in 1980, the daytime population of Washington D.C. (excluding shoppers and tourists) was more than 150 percent greater than the resident

population. In fact, for most large cities, the daytime-to-resident population ratio was even larger. This demand for workers that is unmet by residents implies that core-city firms must pay higher wages to compensate for the costs of commuting and to attract enough workers from the suburbs.

The commuting cost hypothesis offers one explanation for why hospitals in core cities would pay higher wages than hospitals in the suburban ring. It also suggests that, depending on their distance from the residential concentrations within the suburban ring, rural hospitals adjacent to metropolitan areas would have to pay wages comparable to or higher than those paid by hospitals in the suburban ring. The commuting cost hypothesis has ambiguous implications for relative wage levels in non-adjacent rural areas. Some non-adjacent rural areas might be able to meet their employment needs from residents in their immediate area so that no wage differential attributable to commuting costs would be required. However, other more isolated non-adjacent areas might have to pay a higher wage differential to attract more distant labor.

SOURCES OF URBAN-RURAL WAGE DIFFERENCES

Extensive statistical analyses of hospital wage differences were conducted for this report by Cromwell, Hendricks, and Pope (1986). Using data from the 1982 HCFA Wage Survey, they compared the relative wage levels between core-ring urban hospitals and adjacent-nonadjacent rural hospitals. In their analyses they found evidence of core-ring and adjacent-nonadjacent rural wage differentials. Their findings are summarized below.

Rural Wage Differences

Within the current HCFA rural labor markets, hospitals in counties adjacent to urban areas pay wages that are roughly 2.5 percent higher than non-adjacent hospitals. This difference is statistically significant although small in absolute value.

What would happen to rural PPS payments if wage indexes were calculated separately for adjacent and non-adjacent counties within each state? In general, for the high-wage hospitals very little would change. High-wage hospitals are usually big hospitals. Therefore, the current PPS rural wage indexes, which are weighted by total salaried hours, are already generally close to the separate wage index (either adjacent or non-adjacent) that includes these high wage hospitals. For example, in Alabama, Florida or Virginia, where adjacent wages are higher than non-adjacent wages, a separate wage index for adjacent-only hospitals would raise their per case payments by $14.21 - $18.63 (for a case with DRG weight of 1.0) or only 0.7 - 0.9 percent of the total payment. In Massachusetts, adjacent hospitals would gain 3.9 percent. In Colorado, where non-adjacent wages are higher, a separate wage index would raise payments by 3.8 percent ($84 for a case with a DRG relative weight of 1.0).

For the rural group with the lower wage index, generally made up of smaller hospitals, the change would be more marked. In Alabama and Virginia, for instance, the non-adjacent hospitals would lose 2.1-2.4 percent per payment. However, a non-adjacent wage index in Florida would reduce those hospitals' payments by 14.6 percent, in Colorado there would be a 10.9 percent decrease, and in Massachusetts, a 25.4 percent reduction per case. These percentages illustrate the size of the effect

of a wage index change on groups of hospitals. The gains or losses for individual hospitals will vary more.

A redefinition of rural hospital labor markets using BEA Economic Areas would not reduce the adjacent-nonadjacent rural wage differential for the 135 BEA areas with both adjacent and nonadjacent rural counties in them. However, that concern may be misplaced because those nonadjacent hospitals are much fewer in number, are smaller in size, and do not affect the BEA-based wage index as greatly as do the large adjacent hospitals. Therefore, the BEA-based indexes reflect the higher adjacent wages more and will generally increase the PPS adjustments for those hospitals compared to an index for all adjacent counties in the state, at the same time giving a boost to low-wage hospitals in the same BEA areas. For example, in Florida the majority of the adjacent areas are in the south, the nonadjacents are primarily in the western part of the state. The BEA-based indexes capture this difference: the indexes for the peninsula are 0.91 and 0.95 (compared to current and adjacent wage indexes of 0.88) while the westernmost counties are indexed at 0.63.

If the average hourly wages represented by each of the three rural wage indexes (current, adjacent/nonadjacent or BEA-based) are compared to each hospital's own average hourly wage, the net effects are surprisingly similar across the three indexes (see Table 4.1). The BEA-based index reduces the number of hospitals gaining or losing more than 5 percent from the wage index compared to their own wages but only by about 75 hospitals overall (out of 2,626). Further, the <u>average</u> amount of the gain or loss was not much affected by which index was used except for the group gaining or losing only 5 percent or less. Here the average gain

Table 4.1: RURAL HOSPITALS' GAINS/LOSSES UNDER ALTERNATIVE WAGE INDEXES, 1982

Assigned Wage as a Percent of Actual Average Wage	Current Wage Index: Number of Hospitals	Current Wage Index: Percent of Hospitals	Adjacent/Nonadjacent Rural Wage Index: Number of Hospitals	Adjacent/Nonadjacent Rural Wage Index: Percent of Hospitals	BEA - Based Rural Wage Index: Number of Hospitals	BEA - Based Rural Wage Index: Percent of Hospitals
75% or Less	45	2%	43	2%	39	1%
75 to 85%	85	3%	86	3%	84	3%
85 to 95%	405	15%	420	16%	423	16%
95 to 105%	805	31%	807	31%	886	34%
105 to 115%	686	26%	694	26%	650	25%
115 to 125%	351	13%	326	12%	339	13%
Over 125%	243	9%	244	9%	199	8%
	2620					

Table 4.2: URBAN HOSPITALS' GAINS/LOSSES UNDER ALTERNATIVE WAGE INDEXES, 1982

Assigned Wage as a Percent of Actual Average Wage	Current Wage Index: Number of Hospitals	Current Wage Index: Percent of Hospitals	Limited Core/Ring Wage Index (Largest MSAs): Number of Hospitals	Limited Core/Ring Wage Index (Largest MSAs): Percent of Hospitals	Full Core/Ring Wage Index (All but 5 MSAs): Number of Hospitals	Full Core/Ring Wage Index (All but 5 MSAs): Percent of Hospitals
	CORE CITY HOSPITALS					
75% or less	23	2%	19	1%	19	1%
75 to 85%	53	3%	55	4%	50	3%
85 to 95%	246	17%	204	14%	191	13%
95 to 105%	779	52%	764	51%	773	52%
105 to 115%	250	17%	290	20%	298	20%
115 to 125%	86	6%	95	6%	95	6%
Over 125%	49	3%	59	4%	60	4%
	1486					
	SUBURBAN HOSPITALS					
75% or Less	12	1%	11	1%	12	1%
75 to 85%	39	3%	55	4%	56	4%
85 to 95%	122	9%	176	14%	198	15%
95 to 105%	357	27%	450	35%	548	42%
105 to 115%	415	32%	354	27%	288	22%
115 to 125%	209	16%	161	12%	126	10%
Over 125%	146	11%	93	7%	72	6%
	1300					

was cut to one-fourth the size of the average under either the current wage index or an adjacent-nonadjacent one.

In summary, the current wage index is not a source of major payment inequities for rural hospitals. Only 20 percent of rural hospitals have wage indexes that are less than 95 percent of their own wages, and only 2 percent receive less than 75 percent of their own wages. For the nation as a whole, rural hospitals located in counties that are adjacent to urban counties pay slightly higher wages than those located in counties not adjacent to urban areas. This differential also exists within BEA-based rural labor market areas. A wage index based on the rural portions of the BEA areas does a somewhat better job than either currently defined rural areas or an adjacent-nonadjacent split in reducing the number of big winners and losers with respect to wages.

These are not, in themselves, reasons for choosing one of these wage indexes over another in an attempt to more accurately distinguish the labor markets faced by adjacent and nonadjacent rural hospitals. Because we do not thoroughly understand the causes of the wage differentials, we may be overlooking better alternatives for PPS adjustments than any of these tried to date. Further considerations include:

- Wage indexes based either on the BEA areas or on adjacent-nonadjacent divisions of current rural labor markets will magnify the influence of large, high-wage rural hospitals. This would allow them to more easily pass through their wage increases in future. This would also increase the windfalls to the low-wage hospitals that fall into the high wage area of the state.

- Some of the rural high-wage hospitals are rural referral centers that already receive the higher urban standardized amount per case. If they were given a higher wage

- The characteristics of some of the communities of high-wage hospitals suggest that some should be considered urban. For example, for the BEA areas with no MSA in them, consideration should be given to designating the largest city in each as a separate labor market and to computing wage indexes for each of these cities separate from the indexes for the rest of the area. While this would increase these hospitals ability to pass-through their labor costs, it would more accurately reflect labor differences that are not adequately captured by BEA or adjacent/nonadjacent designations.

Urban Wage Differences

The hypothesis concerning core-ring wage differentials was tested for three subsets of the MSAs, those with MSA populations greater than 1 million, with MSA populations of 250,000 to 1 million and with MSA populations under 250,000. The results strongly support the hypothesis that hospitals in core cities of all sizes pay higher wages, on average, than do hospitals in the surrounding suburban areas. The size of the wage differential is about 5 percent in the largest MSAs, 8 percent is medium-sized MSAs, and 7 percent in the smallest MSAs.

Table 4.2 shows the results when two redefinitions (a core-suburban split for 98 largest MSAs and a core-suburban split for all but 5 MSAs) were compared to the current urban definition. There are 2 major results:

- Redefining urban wage indexes according to core cities and suburbs markedly reduces (from 59 percent to either 46 percent or 38 percent) the proportion of suburban hospitals paid 5 percent or more over their actual average wages while increasing the gains for core hospitals marginally (about 3 percent moved from being paid 5-15 percent less to being paid 5-15 percent more than their actual wages).

- Redefining virtually all the urban labor markets instead of just 98 of them almost doubles to 284, the number of suburban hospitals whose net gain on the wage index is greatly reduced. For the 1500 core city hospitals the net changes were only a handful (18) of the total.

Again, the current wage index does not appear to be a major source of payment inequities. Only 17 percent of urban hospitals have wage indexes that are less than 95 percent of their own wages. Most of these receive between 5 and 15 percent less with an average loss of 8 percent. The differences in the effects on the core and suburban ring hospitals (with more suburban hospitals affected) reflect the heavier weight the core hospitals receive in any wage index because of their relatively larger size and number of FTEs. The suburban wage index is pulled up by pooling them with core hospitals more than the core index pulled down.

Even though the statistical analysis appears to support the existence of an urban core for all MSAs, very different types of differentials may be involved in MSAs of different sizes. For example, in the largest MSAs relative crime rates were found to be a powerful predictor of relative wage differentials between the urban core and suburban ring. For those medium and small-sized MSAs for which relative crime indexes were available, they were found to be less effective in explaining the observed wage differentials. This result poses something of a puzzle when considered in conjunction with the fact that the core-ring wage differentials are, on average, larger for medium and small-sized MSAs than for the largest MSAs. It may be that the core-ring wage differential reflects different factors in MSAs of different sizes. An hypothesis that might explain the larger differential in medium and smaller-sized MSAs is that the suburban ring areas of those MSAs are more rural than those of the largest MSAs. For example, the outlying counties of the Wichita, Kansas, or Oklahoma City, Oklahoma MSAs are probably more similar to many rural counties than to the suburban areas of MSAs such as

Chicago or Washington, D.C. Future research on urban hospital wages should concentrate on clarifying the nature of the wage differentials for differing MSA sizes.

The principal findings of the urban and rural wage analyses are that separate core-ring wage indexes may be appropriate for at least the largest MSAs, and perhaps all MSAs regardless of population sizes, and that some subdivision of the current rural labor markets may be appropriate to address the variation in wages. While the BEA-based subdivisions appear to bring the indexes somewhat more into line with the average wage actually paid, they also increase the problems associated with boundaries and with small numbers of hospitals in each subdivision. That is, there are many more rural hospitals that could dispute the appropriateness of a given BEA classification than could argue for a higher "adjacent" wage index. In addition, by dividing rural hospitals into 180 instead of 48 or 96 rural labor markets, the influence of each hospital on the average is enhanced. Therefore, wage increases will be easier to pass through if there is an update of the wage index. Similarly, by dividing urban hospitals into 640 instead of 320 urban labor markets, the influence of each hospital on the average is enhanced. The next section provides a more detailed analysis of the potential financial impact of each of these refinements on various groups of hospitals.

IMPACT OF REVISED URBAN AND RURAL WAGE INDICES

The financial impact of revisions to the urban and rural wage indices discussed earlier was estimated by comparing Medicare operating margins under a fully phased-in version of the current PPS with simulated

operating margins under a PPS based on the alternate wage index. This index differs from the current wage index in that it classifies urban hospitals as core or ring within an MSA, and that it classifies rural hospitals within Bureau of Economic Analysis areas. In the first system, hospital payments were simulated by modeling a fully implemented PPS based on the expected national urban and rural rates for FY 1988. The simulation assumes that all hospitals were reimbursed 100 percent on the basis of their respective national urban or rural rate beginning October 1, 1987. This system is otherwise identical to the current PPS, as described in the final rule for fiscal year 1987 (Federal Register, November 24, 1986). It is the baseline against which the other system will be compared.

In the alternative system, hospital payments were simulated by modeling a fully implemented PPS in which the calculation of the standardized payment amounts was identical to the process used in computing the expected standardized payment amounts for fiscal year 1988, with one exception. The only difference between the calculation of the expected fiscal year 1988 rates used in the baseline simulation and the alternative rates is that, in the alternative payment system, the base year operating cost data used to construct the rates were adjusted by a wage index that grouped all urban hospitals into separate core or ring categories within MSAs, and that grouped rural hospitals into BEA areas rather than states prior to the calculation of wage index values. This wage index will also be used for payment purposes under the alternative system of reimbursement.

Total operating payments under each system were simulated for urban and rural hospitals, as well as other categories of hospitals. Total payments were constrained to be equal for each alternative. In effect, only the market shares of urban versus rural hospitals were allowed to vary across reimbursement systems. Total operating costs were estimated by rolling forward each hospital's 1984 operating cost by actuarial estimates of the hospital market basket rate of increase for the period 1984-1987. Total estimated operating costs for each group were subtracted from the total payments obtained for each option and divided by the total estimated costs for each group resulting in operating margin estimates for each group of hospitals under each alternative reimbursement system. The results of the simulations are presented in Table 4.3.

The use of an alternative wage index based on separate core and ring wage values for urban hospitals and BEA wage values for rural hospitals would alter the financial impact of PPS for only a few specific categories of hospitals. Hospitals located in the urban core would be expected to experience an increase in their operating margins from 12.9 to 14 percent. Suburban ring hospitals, on the other hand, would be expected to experience a decline in their margins from 12.6 to 10.5 percent. The fact that the operating margins of core and suburban ring hospitals are almost identical under the current wage index is probably due to the compensating effects of the indirect medical education and disproportionate share adjustments.

There would also be a narrowing of the margin differential by bedsize, with smaller hospitals (most of which are located in the suburban ring) experiencing relatively lower margins and larger hospitals

TABLE 4.3: ESTIMATED MEDICARE OPERATING MARGINS FOR A BASELINE FULLY PHASED-IN PPS VERSUS A PPS BASED ON A REVISED CORE-RING/BEA WAGE INDEX FOR URBAN AND RURAL HOSPITALS

	Medicare Operating Margins Under:	
	Current System 100 Percent National Rates	Alternative Wage System 100 Percent National Rates
Urban Hospitals by Bedsize:		
0- 99 Beds	17.9	14.9
100-404 Beds	11.9	11.6
405-684 Beds	13.0	13.8
685 + Beds	14.1	15.5
Rural Hospitals by Bedsize:		
0- 99 Beds	14.5	13.7
100-169 Beds	8.4	8.5
170 + Beds	11.3	12.0
Teaching Status:		
Nonteaching Hospitals	12.2	11.5
Resident/Bed .25	12.5	13.1
Resident/Bed .25	15.3	16.6
Disproportionate Share Status:		
Non DSH Hospitals	11.2	11.0
DSH Urban 100 Beds	15.4	15.9
DSH Urban 100 Beds	22.1	19.3
DSH Rural Hospitals	24.0	22.2
Other Special Status:		
No Special Status	12.4	12.4
Sole Community Hospital	4.9	4.7
Rural Referral Center	19.8	20.8
Both SCH and RRC	8.4	8.3
Rural Hospitals 50 Beds	18.6	17.6

TABLE 4.3: ESTIMATED MEDICARE OPERATING MARGINS FOR A BASELINE FULLY PHASED-IN PPS VERSUS A PPS BASED ON A REVISED CORE-RING/BEA WAGE INDEX FOR URBAN AND RURAL HOSPITALS

	Medicare Operating Margins Under:	
	Current System 100 Percent National Rates	Alternative Wage System 100 Percent National Rates
National Average	12.6%	12.6%
Urban Hospitals	12.8	12.8
Rural Hospitals	11.9	11.8
Urban Hospitals by Type:		
Urban Core	12.9	14.0
Suburban Ring	12.6	10.5
Rural Hospitals by Type:		
Adjacent to MSA	11.1	10.9
Nonadjacent to MSA	12.9	12.9
Urban Hospitals by Region:		
New England	3.7	3.6
Middle Atlantic	17.5	17.8
South Atlantic	12.9	13.0
East North Central	7.6	7.6
East South Central	15.7	15.7
West North Central	16.5	16.7
West South Central	16.6	16.5
Mountain	14.9	14.7
Pacific	13.9	13.8
Rural Hospitals by Region:		
New England	5.9	6.3
Middle Atlantic	2.6	2.4
South Atlantic	12.2	11.8
East North Central	8.0	7.9
East South Central	15.5	16.4
West North Central	12.8	12.5
West South Central	18.4	17.8
Mountain	12.3	12.0
Pacific	13.4	13.9

TABLE 4.3: ESTIMATED MEDICARE OPERATING MARGINS FOR A BASELINE FULLY PHASED-IN PPS VERSUS A PPS BASED ON A REVISED CORE-RING/BEA WAGE INDEX FOR URBAN AND RURAL HOSPITALS

	Medicare Operating Margins Under:	
	Current System 100 Percent National Rates	Alternative Wage System 100 Percent National Rates
Urban Hospitals by Bedsize:		
0- 99 Beds	17.9	14.9
100-404 Beds	11.9	11.6
405-684 Beds	13.0	13.8
685 + Beds	14.1	15.5
Rural Hospitals by Bedsize:		
0- 99 Beds	14.5	13.7
100-169 Beds	8.4	8.5
170 + Beds	11.3	12.0
Teaching Status:		
Nonteaching Hospitals	12.2	11.5
Resident/Bed .25	12.5	13.1
Resident/Bed .25	15.3	16.6
Disproportionate Share Status:		
Non DSH Hospitals	11.2	11.0
DSH Urban 100 Beds	15.4	15.9
DSH Urban 100 Beds	22.1	19.3
DSH Rural Hospitals	24.0	22.2
Other Special Status:		
No Special Status	12.4	12.4
Sole Community Hospital	4.9	4.7
Rural Referral Center	19.8	20.8
Both SCH and RRC	8.4	8.3
Rural Hospitals 50 Beds	18.6	17.6

relatively higher margins. For these categories, use of the alternative wage index produced the expected results. Otherwise, use of the revised wage index would not affect in any major way the expected operating margins across the other remaining hospital categories.

With no change in current law over three-quarters of the nation's hospitals would be expected to have positive Medicare operating margins in FY 1988 (Table 4.4). Approximately 4 out of 10 would be expected to have operating margins exceeding 20 percent. Urban and rural hospitals are expected to have roughly identical proportions of hospitals with positive margins. However, within urban areas, a greater percentage of suburban ring hospitals are expected to have positive margins exceeding 20 percent relative to urban hospitals located in the inner core. Within rural areas, a greater percentage of hospitals located in a county nonadjacent to an MSA are expected to have positive margins exceeding 20 percent relative to rural hospitals adjacent to an MSA. Within both urban and rural areas, a greater percentage of small hospitals are expected to have positive margins exceeding 20 percent relative to large hospitals.

For the majority of hospital categories, use of the revised wage index would not substantially alter the distribution of hospitals by expected Medicare operating margins. There is a slight tendency to reduce the percentage of hospitals with margins in excess of 20 percent, thereby tightening the distribution of hospitals somewhat. For certain categories of hospitals, however, the effects are more pronounced. The urban core and suburban ring categories are particularly noteworthy in this regard. In these categories, use of the revised wage index would

TABLE 4.4: ESTIMATED DISTRIBUTION OF HOSPITALS BY MEDICARE OPERATING MARGINS FOR A BASELINE FULLY PHASED-IN PPS VERSUS A PPS BASED ON A REVISED CORE-RING/BEA WAGE INDEX FOR URBAN AND RURAL HOSPITALS

	Percentage of Hospitals with:			
	Operating Margins Less than -20%	Operating Margins Between -20% & 0%	Operating Margins Between 0% & 20%	Operating Margins Greater than 20%
National Average				
Baseline FY 88	3.8%	19.5%	36.8%	39.9%
Revised Wage Index	4.0	20.1	37.0	38.9
Urban Hospitals				
Baseline FY 88	3.3	20.0	37.5	39.2
Revised Wage Index	3.5	20.4	38.2	37.9
Rural Hospitals				
Baseline FY 88	4.4	18.9	36.1	40.6
Revised Wage Index	4.6	19.7	35.7	40.0
Urban Location				
Core Hospitals:				
Baseline FY 88	3.1	23.0	40.0	33.8
Revised Wage Index	2.9	21.0	39.8	36.3
Ring Hospitals:				
Baseline FY 88	3.4	16.8	35.3	44.5
Revised Wage Index	4.0	19.9	36.6	39.6
Rural Location				
Adjacent to MSA:				
Baseline FY 88	4.0	20.6	38.4	37.0
Revised Wage Index	4.0	21.8	37.6	36.6
Nonadjacent to MSA:				
Baseline FY 88	4.8	17.3	33.6	44.3
Revised Wage Index	5.2	17.6	33.9	43.3

TABLE 4.4: ESTIMATED DISTRIBUTION OF HOSPITALS BY MEDICARE OPERATING MARGINS FOR A BASELINE FULLY PHASED-IN PPS VERSUS A PPS BASED ON A REVISED CORE-RING/BEA WAGE INDEX FOR URBAN AND RURAL HOSPITALS

	Percentage of Hospitals with:			
	Operating Margins Less than -20%	Operating Margins Between -20% & 0%	Operating Margins Between 0% & 20%	Operating Margins Greater than 20%
Urban Hospitals				
00 - 99 Beds:				
Baseline FY 88	6.2%	15.7%	28.1%	50.0%
Revised Wage Index	6.0	18.3	28.6	47.1
100-404 Beds:				
Baseline FY 88	2.8	21.8	40.2	35.2
Revised Wage Index	3.2	21.7	41.3	33.8
405-684 Beds:				
Baseline FY 88	0.3	20.4	42.7	36.6
Revised Wage Index	0.3	19.2	41.7	38.7
685 + Beds:				
Baseline FY 88	0.0	19.2	42.5	38.3
Revised Wage Index	0.0	17.8	39.7	42.5
Rural Hospitals				
01 - 99 Beds:				
Baseline FY 88	4.5	17.3	34.3	43.9
Revised Wage Index	4.8	18.2	34.0	43.1
100-169 Beds:				
Baseline FY 88	4.8	27.3	39.8	28.1
Revised Wage Index	4.0	28.8	39.1	28.1
170 + Beds:				
Baseline FY 88	3.5	19.2	46.0	31.3
Revised Wage Index	3.5	17.7	47.5	31.3

reduce by a substantial margin the disparity between core and ring hospitals with respect to the percentage of hospitals with expected margins exceeding 20 percent. A similar reduction in the disparity across urban bedsize categories is observed as well.

The differences between the results in Tables 4.3 and 4.4 for core and suburban ring hospitals should also be noted. The group results in Table 4.3 suggest that the current wage index is preferred, because there is greater disparity between the operating margins of core and ring hospitals under the alternative wage index. This result occurs despite the narrowing of proportions of core and ring hospitals with margins greater than 20 percent (Table 4.4). Although a clearcut interpretation of these differences is not possible, this example shows that the distributional analysis does not always yield the same implications as the group results.

In summary, use of the alternative wage index, which is based on a more refined definition of labor market areas within the existing urban and rural market areas, generally produces a modest improvement in the distribution of Medicare payments across selected hospital categories. Most of the impact occurs within urban areas. Suburban ring hospitals clearly have benefited from being pooled with urban core hospitals in the calculation of the current wage index. If separate wage index values were computed for core and ring hospitals, suburban ring hospitals would experience a noticeable decline in Medicare operating payments and expected operating margins. The disparity in the proportion of core and ring hospitals with operating margins in excess of 20 percent would also diminish.

However, for the core and ring groups as a whole, the difference in their margins would increase. This implies that, without any further modifications to the PPS payment formula, many core hospitals would be overcompensated under the alternative wage index. If the core-ring wage index were to be implemented, it should be accompanied by a reevaluation of the teaching adjustment factor and the disproportionate share adjustment factor, since these compensatory elements of the payment formula were designed to benefit hospitals that tend to be located primarily in the urban core of major metropolitan areas.

Some additional questions are associated with the use of a core-ring wage index. First, the number of MSAs that should be split into core-ring labor market areas is still an open question. In addition, by dividing urban hospitals into 640 instead of 320 urban labor markets, the influence of each hospital on the average is enhanced. The fewer the hospitals grouped together, the more influence a large hospital in the group will exert on the average, allowing it to pass through wage raises in the future.

In conclusion, a case can be made for adopting a revised urban wage index that further segments urban hospitals into a core or ring area. However, it will also require additional analysis to fully identify the ripple effects associated with its use, and to redesign other elements of the PPS payment formula that would be affected by its use.

RESEARCH ISSUES CONCERNING NONLABOR INPUT PRICE ADJUSTMENTS

The Medicare PPS payment formula adjusts payments to hospitals in Alaska and Hawaii for higher prices for hospital inputs other than labor. A major refinement of this geographically based adjustment would

be to extend it to cover price variations within the 48 contiguous states and the District of Columbia. The possibility of such an adjustment was recognized in the Congressional mandate for additional studies of refining the PPS payment formula. The conference agreement on Section 2311 of the Deficit Reduction Act called for a study of regional payments considering "service area characteristics such as market basket prices;...." Other aspects of this mandate are addressed more fully in Chapter 5.

This section reports the feasibility of testing across regions for differences in the prices of hospital inputs other than labor at this time. The major conclusion of these efforts is that there is currently no data available that would either allow the hypothesis concerning non-labor prices to be adequately tested or to form the basis of an index for adjusting hospital payments.

The search for a non-wage index began with HCFA's own hospital input price index (Freeland, et al., 1979, 1981). Table 4.5 presents the expense categories and their relative weights for 1986. This national index measures the average percent change in prices for a fixed market basket of hospital inputs, including labor and non-labor items. It is an index of inflation. Although variations in rates of inflation for hospital prices across the regions of the country have been explored (Freeland, et al., 1981), this same data cannot reveal variations in the price levels themselves.

If, for example, inflation is twice as rapid in one area as in another, that does not imply that prices are twice as high. The prices could have been identical in 1981. However, in the first area they are increasing at 4 percent, in the other, at 2 percent. If this were to

TABLE 4.5 - HOSPITAL MARKET BASKET

(1986 Relative Importance Weights)

Expense Categories	Weight
1. Wages and Salaries	57.29
2. Employee Benefits	10.05
3. Professional Fees	.78
4. Energy and Utilities	2.25
a. Fuel, Oil, Coal, and other Petroleum	.60
b. Electricity	1.06
c. Natural Gas	.35
d. Motor Gasoline	.21
e. Water and Sewage	.03
5. Malpractice Insurance	1.19
6. All Other	28.44
All Other Products	19.77
a. Pharmaceuticals	4.92
b. Food	3.29
(1) Contract Service	1.28
(2) Direct Purchase	2.01
c. Chemicals and Cleaning Products	2.42
d. Surgical and Medical Instruments	2.13
e. Photographic Supplies	2.08
f. Rubber and Plastics	1.86
g. Paper Products	1.09
h. Apparel	.92
i. Minor Machinery Equipment	.39
j. Miscellaneous Products	.67
All Other Services	8.67
a. Business Services	3.00
b. Computer and Data Processing Services	1.53
c. Transportation and Shipping	.97
d. Telephone	.81
e. Blood Services	.47
f. Postage	.30
g. All Other Services Labor Intensive	.97
h. All Other Services: Nonlabor Intensive	.62
Total	100.00

continue, the relative price level in the high inflation area would indeed become twice that in the low inflation area. However, to identify that moment would require knowing that the prive levels were identical at the start. This information is not captured in the price information currently available.

The U.S. Chamber of Commerce publishes an index of relative prices for a large subset of MSAs. One of its uses is by businesses relocating personnel or otherwise concerned with the relative cost of living in various areas around the nation. However, this index is heavily weighted by housing costs. Further, the medical component of the index involves the retail price of a bottle of aspirin and the average daily charge for a hospital inpatient day. These data are not appropriate for examining price variations even if they represented a scientific sample of U.S. hospitals, which they do not.

In the absence of a national index of relative prices, information was found for one major component (energy) that is suggestive of the problems involved in constructing indexes for these inputs. In 1981, the American Hospital Association (AHA) conducted a nationwide survey of hospitals' energy uses, plans, and prices for 1980. (Results are presented in Cromwell, Hendricks, and Pope (1986) and are summarized below.) The responses of over 3,500 hospitals (50 percent of the industry) can be generalized, according to the AHA, to the nine census regions but not to a finer level for analysis.

The AHA survey found that, within the hospital industry, the general concern with controlling energy expenditures was enhanced by the U.S. Department of Energy's Matching Grants Program for Schools and Hospitals. This had led to a significantly higher level of conservation

activity, particularly for capital projects. The AHA found that conservation activity was directly related to energy prices. In 1980, fuel oil was more expensive for hospitals than natural gas. New England (most dependent on oil) was most active in conserving energy; the West South Central region (most dependent on natural gas) was least active. In 1982, natural gas prices rose steeply as their deregulation was speeded up by the Federal Government. It should be expected that those hospitals dependent on natural gas will have increased their activities to conserve also. This latter activity will have major implications for overall hospital conservation because the industry as a whole is heavily dependent on natural gas.

The AHA survey indicates that there was considerable regional variation in energy prices in 1980. Further, there was an even greater variation in the cost of energy per bed (and therefore per patient) because differences in climate led hospitals to use very different amounts of energy for heating and lighting. For example, New England hospitals faced energy prices that were almost 25 percent higher on average than the national mean but spent 44 percent more for energy per bed than the national average because of cold weather.

While these differences are dramatic, it should be borne in mind that energy costs were only between 2 and 2.5 percent of total hospital expenditures at the time of the survey. This amounts to between 10 and 12 percent of the total non-labor component of hospital costs. If energy prices were the only non-labor input prices that varied regionally (i.e., drug and medical supple prices did not vary), a price index over all nonlabor prices would vary from only 0.97 in the West North Central

region to only 1.03 in New England even though the energy price index values ranged from 0.71 to 1.23. If other price variations offset the energy price differences, the net effect would be less. If other prices are correlated at all with energy prices, the range would be greater.

It should also be remembered that low indexes for regions more dependent on natural gas undoubtedly would have been altered by the 1982 rise in natural gas prices and are being changed again by the drop in oil prices in 1986. Given this potential volatility in prices, if an energy index were to be incorporated into PPS, a continuously updated source of price changes would be required.

This brief overview of the AHA data suggests that more work should be done on relative energy prices in the future. They do vary across regions. However, it may be prudent to wait until other non-labor input prices can be adequately incorporated into one index. The available information suggests that possible inequities in this area may be small compared to other areas of the PPS formula that could be refined.

AN ANALYSIS OF VARIATIONS IN LABOR-NONLABOR SHARES BY DRG

As part of DEFRA, Congress mandated a special study of the variation in the labor component by DRG. Concern was founded on a simplifying assumption of PPS that a constant percent of each DRG's operating rates are labor-related. (Originally, 79 percent was assumed to labor-related. Based on updated input price information, the figure was lowered to 75 percent for FFY 1987.) This assumption might produce a systematic bias in payment rates across DRGs which, if correlated with the area wage index, could bias downwards PPS payments for device-intensive DRGs and certain hospitals. Hospitals in low wage areas

treating nonlabor intensive DRGs may be underpaid using a constant labor share. Similarly, hospitals treating labor intensive DRG's in in high wage areas may also be underpaid, other things equal. Overpayments may occur for DRGs treated in high-wage areas that are nonlabor intensive or for DRGs treated in low-wage areas that are labor intensive.

Public debate so far has focused on just one group of DRGs, those with less-than-average labor intensity and typified by their medical device intensity (e.g., pacemaker implants, hip surgery). ProPAC (1986, pp. 87-96 in its Technical Appendix) conducted a survey of medical devices costing over $300.00 and identified 36 DRGs which account for the majority of expensive device discharges. While minor technical criticisms can be made of ProPAC's methodology, the study as a whole provides valuable insights into the kinds of expensive devices common to selected DRGs and how payments may be systematically biased against hospitals in low wage areas treating these case.

This section summarizes the findings of a study which expands upon the ProPAC analysis by including both labor and nonlabor-intensive DRGs (Cromwell, Hendricks, and Pope, 1987). The following questions were addressed:

- How much variation exists in labor shares among the DRG's?
- What is the distribution of nonlabor and labor intensive DRGs across urban-rural location, area wage index, teaching status, and bedsize?
- How much of the systematic underpayment of nonlabor intensive DRG's in low wage (rural) areas is offset by systematic overpayment of labor intensive DRG's?

Labor Intensity by DRG

The first of these questions can be addressed by developing estimates of labor costs for each DRG. These labor shares were computed for each DRG by summing the product of two elements for each of 9 cost categories (e.g., routine, special care, and ancillary costs): (a) the cost weighted labor share, and (b) the percentage of DRG costs that are attributable to each cost category. Dividing these percentages by the national average labor percentage yields an estimate of the relative labor share for each DRG.

The 1983-1984 cost reports are used to determine the labor shares by cost category. The percentage of DRG costs by cost category was based on 1981 data. Data availability and data processing constraints precluded using the same data base years. However, this difference is not expected to significantly bias the results.

The 1983-1984 hospital cost data was adjusted to reflect the labor and non-labor costs as accurately as possible. Cost reclassifications were generally the most troublesome, because the labor composition is not identified on the cost reports. Since capital costs (e.g. depreciation, interest, taxes, etc.) are separately reimbursed, these costs were exlcuded from the overhead allocation. It is important to note that the overhead labor allocation sets a floor on the inter-department variation in labor shares. The more labor-intensive the overhead services are, the less variation will exist in the labor shares across departments and consequently DRGs.

Since the primary concern is how different hospitals are affected by the use of a constant labor share, a Labor Intensity Index (LII) was constructed for each hospital by multiplying the proportion of cases in

each DRG by each DRG's labor share and then summing across all DRG's. For hospitals with a higher than average labor intensity, the LII exceeds 1.0, while the value will fall below 1.0 for non-labor intensive case mixes. Cross tabulating the hospital LII values by the area wage index (among other hospital characteristics) indicates whether a systematic bias exists, or whether a general offset of high and low labor intensive cases is evident within hospitals.

Labor shares could be obtained for only 437 DRGs, since the other 33 had no Medicare discharges (mostly for DRG's involving children under age 17). The mean of the index is .993, and the median is .991, which implies an almost symmetric distribution of DRG labor shares around the national average. The standard deviation of .041 is indicative of very small variation on average.

The maximum range of variation, of course, was much higher. A 33.4 percentage point difference exists between the least and most labor intensive DRG. DRG 118, cardiac pacemaker pulse generator replacement only, had a labor share only 78.3 percent of the national average, while DRG 430, psychoses, had a labor share 11.7 percent above average. Compared to DRG 118, DRG 430 had a labor share that was almost 50 percent greater. Table 4.6 lists the 10 DRGs with the smallest and largest labor shares. Four of the six least labor intensive DRGs are related to implanting or replacing pacemakers which is quite common among the elderly.

According to ProPAC, pacemakers cost between $2,000 and $6,000, which is a significant addition to DRG medical supply costs. This, coupled with relatively short stays of 5-16 days, results in a high percentage of costs incurred in supplies and drugs (35 percent for DRG 118) and

TABLE 4.6:

THE TEN MOST LABOR INTENSIVE DRGs:

DRG	Description	Indexed Labor Share
430	PSYCHOSES	111.7%
426	DEPRESSIVE NEUROSES	110.5
427	NEUROSES EXCEPT DEPRESSIVE	110.4
436	ALCOHOL/DRUG DEPENDENCE WITH REHABILITATION THERAPY	110.3
428	DISORDERS OF PERSONALITY AND IMPULSE CONTROL	110.0
462	REHABILITATION	109.9
431	CHILDHOOD MENTAL DISORDERS	109.6
434	ALC/DRUG ABUSE, INTOX. INDUCD., NSTL SYN EXC DEPEND &/OR OTHER SYMPTOMS	108.9
438	NO LONGER VALID	107.7
435	ALC/DRUG DEPENDENCE, DETOX &/OR OTHER SYPTOMATIC TREATMENT	107.6

THE TEN LEAST LABOR INTENSIVE DRGs:

DRG	Description	Indexed Labor Share
118	CARDIAC PACEMAKER PULSE GENERATOR REPLACEMENT ONLY	78.3%
116	PERM. CARDIAC PACEMAKER IMPLANT W/O AMI, HEART FAILURE OR SHOCK	84.2
252	FX, SPRNS, STRNS & DISLN OF FOREARM, HAND, FOOT AGE 0-17	86.5
39	LENS PROCEDURES W/ OR W/O VITROECTOMY	88.9
117	CARDIAC PACEMAKER REPLACE & REVIS. EXC. PULSE GEN. REPL. ONLY	89.6
115	PERM. CARDIAC PACEMAKER IMPLANT W/AMI. HEART FAILURE OR SHOCK	89.9
361	LAPAROSCOPY AND INCISIONAL TUBAL INTERRUPTION	90.3
105	CARDIAC VALVE PROCEDURE W/ PUMP & W/O CARDIAC CATH.	90.3
165	APPENDECTOMY W/ COMPLICATED PRINC. DIAG. AGE UNDER 70 W/O CC	90.4
107	CORONARY BYPASS W/O CARDIAC CATH.	91.4

relatively little in routine or ICU care (only 23 percent for DRG 118). DRGs 105 and 107 are also very nonlabor intensive.

Turning to the labor-intensive DRGs the vast majority are made up of psychiatric and alcohol-drug DRGs. Indeed, the top five most labor-intensive DRGs include four psychiatric and one alcohol-drug dependence DRG, and nine out of the top ten fall into these two categories. The only other labor-intensive DRG in the top 10 is DRG 462, rehabilitation.

Labor Intensity by Type of Hospital

The next step in the analysis was to combine the information on labor intensity by DRG with DRG frequencies across hospitals, producing an average labor intensity index by hospital.

The unweighted mean is exactly 1.0 while the mean weighted by hospital discharges is .99, reflecting the fact that larger hospitals have a slightly less labor intensive Medicare casemix. The standard deviation around the unweighted mean is .0147, implying that a large percentage of hospitals fall within plus-or-minus 1.5 percent of the national average. There is a small group of less than 1-in-100 hospitals, however, that are much more labor or nonlabor intensive. At one extreme is a hospital whose average labor intensity is 11 percent above average while another shows an average intensity 10 percent below average.

While the variation in labor intensity appears to be minimal, the fact that at least a few hospitals exhibit extreme values raises the possibility of systematic bias across one or more hospital characteristics. However, the investigation of this issue revealed very

few systematic relationships. Less-than-50-bed hospitals have an average labor intensity 1.2 percent above average versus the over-500-bed hospital, which is only 2 percent below average. The difference between teaching and nonteaching hospitals is even smaller. Urban hospitals are about 1.5 percent less labor intensive in their DRG mix than rural hospitals, which is consistent with the inverse relationship between labor intensity and bedsize. Rural hospitals are much smaller, and the smaller the hospital, the less likely it is that they will be treating significant numbers of medical device and/or alcohol-drug intensive cases.

Recall the theoretical argument made earlier that, a systematic bias would arise at the hospital level if average labor intensity increased with the wage index. Fortunately, the relationship is very weak. The mean labor intensity of the least expensive market areas is 1.002 versus .983 for the most expensive market areas. Across broad market areas, it would appear that a slight cross-subidy is taking place, with hospitals in both the high and low wage areas being slightly overpaid. Low wage area hospitals are being overpaid because more of their costs are labor-related than assumed under PPS. High wage hospitals are similarly overpaid because slightly too much of their costs are assumed to be labor related.

The average hospital frequency per 1,000 discharges of the top and bottom ten labor intensive DRGs reflects a systematic averaging out process that naturally compresses the mean intensity across hospitals. Rural hospitals average only 14.2 discharges per 1,000 in the extreme nonlabor intensive DRGs compared to a 31.5 per 1,000 among urban hospitals. Similarly, rurals average about 20 per 1,000 discharges in the very labor intensive psychiatric, alcohol/drug, and rehabilitation

DRGs versus 27.2 per 1,000 among urban hospitals. The disparity among labor intensive DRGs is not as great as among nonlabor intensive DRGs, which is consistent with the greater overall labor intensity of rural hospitals' casemix.

Rural hospitals in particular were concerned that they were being underpaid in treating nonlabor intensive DRGs, yet they do far fewer pacemaker implants and replacements (DRGs 115-118), lens procedures (DRG 39), and open heart surgery (DRGs 105 and 107) than urban hospitals, both absolutely and as a percent of all discharges. Because they also treat disproportionately fewer of the very labor intensive DRGs as well, their average labor intensity is only slightly higher than in urban areas.

Most of the urban-rural difference that does exist can be explained by the systematic difference in bedsize and the narrower scope of services in small, rural hospitals. Less than five discharges per 1,000 in under-50-bed hospitals fall within the ten least labor intensive DRGs versus 42 per 1,000 in the over-500-bed institutions. Very small hospitals implant or replace pacemakers in fewer than two discharges per 1,000 compared to 9.4 per 1,000 in very large hospitals. Nearly a seven-to-one difference in frequency is also noted for lens procedures. At the other extreme, only 4.4 rural discharges per 1,000 involve psychoses (DRG 430) versus 16.5 per 1,000 in very large hospitals.

Teaching hospitals likewise show the same systematic offset with major teaching institutions treating disproportionately more of the extreme DRGs. Hospitals in very low wage areas treat relatively few patients in either extreme DRG group, while hospitals in high wage areas treat disproportionately more of both. This is again explained by the strong correlation between the wage index, rural location, and bedsize,

the last being the determining factor in the hospital's scope of services and ability to treat extremely labor or nonlabor intensive illnesses.

Offsetting Effects of Over and Under Payments

Several conclusions can be drawn from the analysis of inter-DRG differences in labor intensity. First, because most DRGs make use of hospital services in similar (or offsetting) proportions, the overall variation in DRG labor intensity is far less than across cost centers. Nevertheless, a small group of about 50 DRGs are somewhat more or less labor intensive than average. Labor intensive DRGs are dominated by the psychiatric, alcohol/drug, and rehab admissions while nonlabor intensive DRGs include pacemaker, open heart, and eye surgery.

Second, when DRG casemix within the hospital is accounted for, the variation in labor intensity is further reduced to minimal proportions. Ninety-eight percent of all short-term general hospitals show an average labor intensity plus or minus 3 percent of the national average.

Third, no strong systematic bias is found in the PPS assumption of fixed labor-nonlabor proportions across key hospital characteristics. If anything, low and high wage areas are being slightly subsidized in that their average labor intensity is inversely related to the wage index. Rural hospitals in particular treat very few of either extreme DRG group. Thus, while they may be underpaid for the few device-intensive cases they treat, such cases are so uncommon (e.g., less than 2 in 1,000 pacemaker discharges) that the average labor intensity in rural hospitals is slightly above average. If any group is benefitting from the fixed proportions assumptions, and it is only slightly, it would appear to be the small, under-50-bed hospital in low wage areas and the large, over-500-bed hospital in high wage areas.

SUMMARY

This chapter reported the results of analyses that examined whether hospital cost differences could be the result of imperfectly measured input costs. If so, then refinement of the wage index and additional nonlabor input price adjustments may redress the problem. It also reported the findings of a study of the variation in the proportions of labor-related costs among DRG's, and the effect of assuming a constant labor-related cost share for all DRG's in applying the PPS wage index adjustment.

The principal findings of the urban and rural wage analyses were that several issues need to be resolved to demonstrate that further wage index adjustments would clearly improve the PPS payment formula. Separate core-ring wage indexes for urban areas may be appropriate, although the number of MSAs that should be split into core-ring labor market areas is still an open question. Similarly, some refinement of the current rural labor markets may be appropriate to address the variation in wages.

Use of an alternative wage index, based on a core-ring split in all urban areas and a BEA-based rural labor market definition, produced some improvement in the distribution of Medicare payments across selected hospital categories. However, most of the impact occurred within urban areas.

If separate wage index values were computed for core and ring hospitals, suburban ring hospitals would experience a noticeable decline in Medicare operating payments and expected operating margins. The disparity in the proportion of core and ring hospitals with operating margins in excess of 20 percent would also diminish. However, for core and ring hospitals as a whole, the effects were too great and the

difference in the group operating margins were actually widened by the core-ring wage index (i.e., the core hospitals as a group are overcompensated relative to the suburban ring hospitals).

This chapter also examined differences in the prices of hospital inputs other than labor. The major conclusion of this effort was that there is currently no data available that would either allow the hypothesis concerning non-labor prices to be adequately tested or to form the basis of an index for adjusting hospital payments.

Finally, the chapter described an analysis of the impact on urban and rural hospitals of the simplifying assumption employed in PPS that the proportion of costs that are labor-related is constant across all DRG's. This analysis responds to the mandate of Section 2311(e) of the Deficit Reduction Act of 1984. The study found that offsetting factors minimize any systematic bias from the use of this assumption for the vast majority of hospitals.

Chapter 5

OTHER GEOGRAPHICAL REFINEMENTS

This chapter addresses the mandates described in Chapter 1 to study and discuss the relative merits of retaining some form of regional and hospital specific payment beyond the transition period. It further responds to the report of the conference agreement on the 1984 Deficit Reduction Act, which states that:

> "It is the intent of the conferees that, in studying methods of payment made on a regional basis, the Secretary shall take into consideration regional variations in economic environment such as unemployment rates, the share of publicly funded patients, and the relationship of regional economic indicators to regional health care costs. In addition, the study shall consider...service area characteristics such as market basket prices; labor market; economic base, and population growth, density and age."

Among the results presented in Chapter 2 were comparisons of Medicare operating margins in the first PPS year with those for a fully phased-in PPS based on fully national rates. These results showed that the combined effects of eliminating regional and hospital specific rates are expected to result in moderate regional variation in operating margins. As was discussed in Chapters 3 and 4, if PPS adjustments fully accounted for hospital outputs and input prices, any difference in standardized average costs across hospitals could be attributed to differences in efficiency. Therefore, any systematic regional difference of standardized average costs would be due to variations in average regional

efficiency. In this case, computing regional standardized payment amounts would be unjustified.

However, the PPS payment system may not incorporate all differences in hospital outputs and input prices. As was seen in Chapters 3 and 4, the elements included in the payment formula are not perfect measures of what they were intended to capture. Hence, variation in standardized hospital costs could be due to any of the following sources: (1) hospital outputs or input prices omitted from PPS; (2) measurement error in PPS adjustments for hospital outputs or input prices; or (3) differences in efficiency. Any of these three sources of variation may be correlated with regional location.

While regional differences in efficiency would not justify regional payment amounts, regional output and input price variation would, if unaccounted for by other PPS factors. Until it is possible to identify with certainty the source(s) of the remaining variation in standardized hospital costs, continuation of the regional component of PPS payment rates is one means of correcting for potential biases in the payment formula. Also, blending a hospital-specific rate with either national or regional rates is another alternative to compensate for potential biases.

The first section of this chapter summarizes the findings of a study of regional hospital cost variation and its implications for PPS payments (Cromwell, Hendricks, and Pope, 1986). The second section summarizes some of the advantages and disadvantages of maintaining a hospital specific payment rate. The third section describes the impact of eliminating or retaining regional and hospital specific payment rates and discusses the implications for potential ways of blending these rates.

REGIONAL VARIATION IN HOSPITAL COSTS

Ultimately, regional adjustments to PPS payments must be justified by regional differences in the efficient costs of hospital operation. Moreover, to warrant retention of regional payment amounts, regional costs differences must be unaccounted for by other PPS adjustments such as the wage index, the casemix index, and the adjustment for serving a disproportionate share of low income patients and for indirect teaching costs. An analysis of the extent of cost variation in mean hospital Medicare cost per case among the nine Census Divisions and the factors that account for it yielded the following results. (See Table 5.1).

First, unadjusted costs vary substantially among regions. In 1984, Pacific hospitals' average costs were 33 percent above the national average, while East South Central hospitals' costs were 23 below, a range of 56 percent. Middle Atlantic and New England hospitals were also much costlier than average, while West North Central and West South Central hospitals had much lower than average costs.

The PPS adjustments for wages and casemix explain the majority of regional variation in average hospital cost per case. Deflating costs by the PPS casemix index and the PPS wage index accounts for about 52 percent of the standard deviation of the nine regional percentage differences from national average costs. Adjusting costs for wages and casemix does not eliminate regional variation, however. Deflated New England costs are still 17 percent above average, while deflated East South Central costs are 11 percent below the mean, a range of 28 percent.

The four PPS variables: wages, casemix, urban-rural location, and residents per bed, together explain three-quarters or more of regional differences in mean hospital cost per case. These variables account for

TABLE 5.1: PERCENTAGE DIFFERENCE OF AVERAGE REGIONAL 1984 MEDICARE HOSPITAL COST PER CASE FROM NATIONAL AVERAGE

		Adjustments to Cost		
	Unadjusted	Case Mix and Wages	Case Mix Wages Teaching Urban-Rural	Previous Variables & Economic-Demographic Indicators
New England	23%	17%	10%	8%
Middle Atlantic	24	10	2	-2
South Atlantic	-2	0	-1	0
East North Central	11	6	4	2
East South Central	-23	-11	-8	-3
West North Central	-17	-8	-2	0
West South Central	-14	-7	-5	-3
Mountain	-8	-4	1	3
Pacific	33	10	6	1
Standard Deviation	20.4	9.7	5.5	3.5

The standardard deviation is computed on the basis of the regional percentage deviations, i.e., of the nine numbers displayed in the row.

73 percent of the standard deviation of regional cost differences from the national mean. However, after holding these four variables constant, an unexplained range in costs of about 18 percent persists. New England hospitals' costs are still 10 percent above average and East South Central hospitals' costs are 8 percent below average.

What factors explain the remaining regional variation in hospital costs? A number of county economic and demographic conditions were examined, and were found to account for about two-fifths of the regional cost variation unaccounted for by the four PPS variables. Among the various economic and demographic variables, county population density, rental (i.e., housing) costs, and per capita income are most strongly associated with standardized hospital costs. Other statistically significant variables include population growth, the unemployment rate, and the proportion of the population below the poverty line.

County population density primarily measures cost differences among more and less densely populated zones within fairly small areas, rather than broader regional cost differences. However, the relationship of population density to cost is more continuous than can be captured by the current PPS urban-rural dichotomy. In addition to its relationship to urban-rural cost differences, the correlation of population density with costs is also partly explained by hospital bedsize and teaching intensity. Large hospitals and teaching hospitals tend to be located in more densely populated areas.

Rental housing costs are associated with broader geographical variation in standardized costs than is population density. The correlation of rental housing costs with hospital costs is not explained by hospital bedsize or teaching intensity and is not strongly related to

urban-rural cost differences. It could be capturing regional practice pattern or input price differences.

The correlation between per capita income and costs exists over broader geographical regions, as well as in smaller areas. Per capita income may be measuring a more intensive, and hence costlier, style of practice in wealthier areas. It may also be picking up input price differences not captured by the wage index.

Implications for PPS Payments

The four PPS variables: wages, casemix, urban-rural location, and residents per bed, together explain three-quarters or more of regional differences in mean hospital cost per case. Additional demographic and economic conditions were examined to determine how much of the remainder could be explained. County population density and rental housing costs are the two variables most strongly associated with the remaining differences in hospital costs. However, these variables are indirect determinants of hospital costs. Their correlations with standardized costs are due to regional variations in hospital outputs or input prices not captured by PPS factors, or to regional variations in efficiency. If it were possible to accurately measure hospital outputs, input prices, and efficiency, they could be used to fully account for hospital cost differences. After adjusting for these factors, geographical economic and demographic indicators would have no influence on costs. However, since some cost-causing factors are omitted from PPS, and other included ones are measured with error, certain geographical indicators have been found to be correlated with standardized costs. With sufficient refinements to the PPS payment system, these correlations can be expected

to be reduced. With sufficient refinements, the need for separate regional rates would be reduced as well. However, until such adjustments are made, continuation of the regional component of PPS payment rates is one means of compensating for potential biases in the payment formula.

ISSUES CONCERNING HOSPITAL SPECIFIC ADJUSTMENTS

The principal advantage in retaining hospital specific rates as part of the Medicare payment system is that it would automatically adjust for errors in the wage index, the relative weights, and other imperfections in the current payment formula. In this regard, the hospital-specific rate is a more comprehensive way of adjusting for these limitations than are regional rates, or any other grouping of hospitals for rate setting purposes. The incentives of PPS are retained as well, since the hospital specific rate is prospectively determined.

There are, however, a number of disadvantages associated with the retention of a hospital specific component. First, it perpetuates varying payment rates among hospitals in a single locality, thereby providing a competitive advantage to those hospitals with higher historical costs, regardless of whether such higher costs were related to inefficiency or to other variables not accounted for by the payment formulas.

Second, retention of hospital specific rates implies an underlying assumption that hospitals with higher-than-average base year costs have less flexibility to modify their operations and their cost structure than hospitals with lower-than-average base year costs. The results presented in chapter two suggest that the reverse may be true, that is, that hospitals with historically higher costs (e.g., large, urban, teaching

hospitals) had greater flexibility to adjust to PPS than hospitals with historically lower costs (e.g., small, rural, nonteaching hospitals).

Finally, the longer a hospital specific rate is retained, rebasing the hospital specific rate becomes more and more of an issue. If the rate is to be updated, the potential exists for passing through future increases in costs over the base period. If it is not updated, it will gradually lose its relevance to a hospital's current operations. From a program administration standpoint, maintining hospital-specific rates has been a source of numerous problems:

- Since the hospital specific rate is related to base period costs, hospitals are continually seeking upward adjustment of the base year costs in order to increase their prospective payment rates, resulting in considerable review work for fiscal intermediaries.
- Hospitals are dissatisfied with the prospective relief rule applicable to adjustment of the hospital specific rate. This has generated considerable correspondence and litigation.
- Since the hospital specific rate is related to base period costs, it can be continually fine tuned as a function of appeals. Unlike the Federal rates, which adjudicators of appeals accept as being estimates not subject to revision, the courts have, in some instances, held that the hospital specific rate must be retroactively revised to accommodate later information that comes to light or events that occur subsequent to the base period (despite regulations to the contrary). Such adjustments potentially can be very costly to the program.

IMPACT OF RETAINING REGIONAL OR HOSPITAL SPECIFIC PAYMENT RATES

The simulation results presented in Chapter 2 showed the combined effects of eliminating regional and hospital specific rates in completing the transition to a fully phased-in PPS. This section analyzes the separate effects of the regional and hospital specific rates by simulating PPS payments for fully national, regional, and hospital

Federal and hospital specific payments were modeled under policies included in the Health Care Financing Administration's final rule for fiscal year 1987 (Federal Register, November 24, 1986), with the exception that regional and national payments were simulated using the expected standardized payment amounts for fiscal year 1988. Hospital specific payments were simulated by applying the update factors specified in the fiscal year 1987 final rule to each hospital's base year cost per case. Three alternative simulations are presented in Table 5.1. The first column presents the estimated results of the current system, once it is fully phased-in (i.e., 100 percent national rates). The second column presents the estimated results of a PPS based on 100 percent regional, federal rates. The final column presents the results of a 100 percent hospital specific payment system.

Overall hospitals would have slightly higher operating margins under a 100 percent national or regional payment system than under a 100 percent hospital specific payment system. This finding can be attributed to the use of different base year cost data for computing federal versus hospital specific payment rates, and the use of audited cost report data in the calculation of the hospital specific rate versus unaudited data in the calculation of the federal rates. However, the operating margins for rural hospitals are estimated to be four or five percentage points higher under fully federal rates, whereas margins for urban hospitals are estimated to increase less than one percentage point. This finding is a result of the recent changes in the calculation of urban and rural rates as mandated by the Omnibus Budget Reconciliation Act of 1986. As was discussed in Chapter 2, these changes have tended to correct a payment bias that favored urban hospitals at the expense of rural hospitals.

Eliminating Hospital Specific and Regional Rates

Eliminating hospital specific payments (i.e., a payment system based on either 100 percent regional or national rates) will tend to result in lower payments (and, hence, lower operating margins) to larger hospitals because these hospitals tended to have relatively high operating costs in the base year. Conversely, eliminating hospital specific payments results in higher payments to smaller, less expensive hospitals in both rural and urban areas. However, large expensive hospitals that are also teaching and/or disproportionate share hospitals will tend to offset part or all of the payments lost through the elimination of the hospital specific rate by increases in indirect medical education and disproportionate share payments. Large hospitals and other hospitals with high hospital specific rates that do not qualify for teaching or disproportionate share payments are expected to be relatively worse off as a result of eliminating hospital specific payments.

Eliminating regional rates would tend to disadvantage high cost regions such as the New England and East North Central regions. Conversely, low cost regions such as the East South Central region would receive higher payments. Otherwise, the effects of 100 percent regional or national rates are roughly identical for the broad hospital categories displayed in Table 5.2.

The distribution of hospitals by Medicare operating margins under each of the three payment systems is displayed in Table 5.3 for urban and rural hospitals by region. The most striking observation from this table is the substantial tightening of the distribution under a 100 percent hospital specific payment system relative to a 100 percent federal payment system. Whereas approximately 40 percent of all hospitals are

TABLE 5.2: ESTIMATED MEDICARE OPERATING MARGINS FOR A BASELINE FULLY PHASED-IN PPS VERSUS A PPS BASED ON 100% REGIONAL RATES, AND A PPS BASED ON 100% HOSPITAL SPECIFIC PAYMENT RATES

	Medicare Operating Margins Under:		
	Current System 100 Percent National Rates	Current System 100 Percent Regional Rates	Current System 100 Percent HSP Rates
National Average	12.6%	12.0%	10.9%
Urban Hospitals	12.8	12.3	11.8
Rural Hospitals	11.9	10.7	6.8
Urban Hospitals by Region:			
New England	3.7	8.2	2.3
Middle Atlantic	17.5	12.8	7.1
South Atlantic	12.9	10.7	9.9
East North Central	7.6	14.5	13.4
East South Central	15.7	7.1	9.0
West North Central	16.5	16.4	19.8
West South Central	16.6	14.4	18.3
Mountain	14.9	10.7	12.6
Pacific	13.9	11.5	13.6
Rural Hospitals by Region:			
New England	5.9	11.5	6.1
Middle Atlantic	2.6	5.6	-0.2
South Atlantic	12.2	11.2	5.5
East North Central	8.0	12.8	8.9
East South Central	15.5	11.6	7.0
West North Central	12.8	10.6	8.6
West South Central	18.4	11.3	7.8
Mountain	12.3	8.1	6.6
Pacific	13.4	9.7	6.4
Urban Hospitals by Type:			
Urban Core	12.9	12.2	12.9
Suburban Ring	12.6	12.5	9.8
Rural Hospitals by Type:			
Adjacent to MSA	11.1	10.2	6.7
Nonadjacent to MSA	12.9	11.5	6.8

TABLE 5.2: ESTIMATED MEDICARE OPERATING MARGINS FOR A BASELINE FULLY PHASED-IN PPS VERSUS A PPS BASED ON 100% REGIONAL RATES, AND A PPS BASED ON 100% HOSPITAL SPECIFIC PAYMENT RATES

	Medicare Operating Margins Under:		
	Current System 100 Percent National Rates	Current System 100 Percent Regional Rates	Current System 100 Percent HSP Rates
Urban Hospitals by Bedsize:			
0- 99 Beds	17.8	16.8	6.8
100-404 Beds	11.9	11.4	11.0
405-684 Beds	13.0	12.7	13.3
685 + Beds	14.1	13.7	14.6
Rural Hospitals by Bedsize:			
0- 99 Beds	14.5	12.7	6.7
100-169 Beds	8.4	7.9	6.2
170 + Beds	11.3	10.6	7.3
Teaching Status:			
Nonteaching Hospitals	12.2	11.2	8.9
Resident/Bed .25	12.5	12.5	13.3
Resident/Bed .25	15.2	14.9	12.9
Disproportionate Share Status:			
Non DSH Hospitals	11.2	11.0	10.6
DSH Urban 100 Beds	15.4	14.0	11.8
DSH Urban 100 Beds	22.0	19.1	2.0
DSH Rural Hospitals	24.0	21.4	6.5
Other Special Status:			
No Special Status	12.4	11.9	11.1
Sole Community Hospital	4.9	2.8	5.2
Rural Referral Center	19.8	18.3	9.6
Both SCH and RRC	8.4	8.1	8.5
Rural Hospitals 50 Beds	18.6	16.1	3.6

TABLE 5.3: ESTIMATED DISTRIBUTION OF HOSPITALS BY MEDICARE OPERATING MARGINS FOR A BASELINE FULLY PHASED-IN PPS VERSUS A PPS BASED ON 100% REGIONAL RATES, AND A PPS BASED ON 100% HOSPITAL SPECIFIC PAYMENT RATES

	Percentage of Hospitals with:			
Urban Hospitals	Operating Margins Less than -20%	Operating Margins Between -20% & 0%	Operating Margins Between 0% & 20%	Operating Margins Greater than 20%
New England:				
Baseline FY 88	6.5%	29.9%	42.4%	21.2%
100% Regional System	4.9	23.4	39.1	32.6
100% HSP System	8.2	35.3	49.5	7.1
Mid Atlantic:				
Baseline FY 88	1.9	13.2	40.5	44.6
100% Regional System	2.2	21.8	38.9	37.1
100% HSP System	4.7	25.2	47.0	23.1
South Atlantic:				
Baseline FY 88	4.0	18.7	40.6	36.8
100% Regional System	4.2	23.6	38.6	33.6
100% HSP System	5.0	19.2	60.7	15.2
East North Central:				
Baseline FY 88	2.9	28.9	39.6	28.7
100% Regional System	1.6	16.0	40.9	41.5
100% HSP System	1.8	11.7	66.5	20.1
East South Central:				
Baseline FY 88	1.2	15.2	37.6	46.1
100% Regional System	4.9	24.2	36.4	34.6
100% HSP System	4.2	24.2	52.7	18.8
West North Central:				
Baseline FY 88	1.0	17.8	34.5	46.7
100% Regional System	1.0	17.8	34.0	47.2
100% HSP System	3.1	14.2	46.2	36.6
West South Central:				
Baseline FY 88	2.4	16.3	34.7	46.6
100% Regional System	2.9	18.2	35.5	43.4
100% HSP System	5.4	15.2	43.1	36.3
Mountain:				
Baseline FY 88	6.0	12.0	44.0	38.0
100% Regional System	6.0	18.0	43.0	33.0
100% HSP System	9.0	14.0	44.0	33.0
Pacific:				
Baseline FY 88	4.4	19.7	31.3	44.6
100% Regional System	5.0	22.3	32.1	40.6
100% HSP System	4.4	21.3	45.0	29.3

TABLE 5.3: ESTIMATED DISTRIBUTION OF HOSPITALS BY MEDICARE OPERATING MARGINS FOR A BASELINE FULLY PHASED-IN PPS VERSUS A PPS BASED ON 100% REGIONAL RATES, AND A PPS BASED ON 100% HOSPITAL SPECIFIC PAYMENT RATES

	Percentage of Hospitals with:			
Rural Hospitals	Operating Margins Less than -20%	Operating Margins Between -20% & 0%	Operating Margins Between 0% & 20%	Operating Margins Greater than 20%
New England:				
Baseline FY 88	3.6%	25.0%	44.6%	26.8%
100% Regional System	1.8	25.0	32.1	41.1
100% HSP System	0.0	25.0	58.9	16.1
Mid Atlantic:				
Baseline FY 88	6.6	35.2	34.1	24.2
100% Regional System	4.4	25.3	37.4	33.0
100% HSP System	11.0	37.4	40.7	11.0
South Atlantic:				
Baseline FY 88	5.1	18.5	37.3	39.1
100% Regional System	5.3	19.1	36.1	39.4
100% HSP System	6.6	28.1	51.9	13.4
East North Central:				
Baseline FY 88	2.7	24.4	46.6	26.3
100% Regional System	1.6	17.8	44.1	36.4
100% HSP System	2.5	26.3	56.4	14.8
East South Central:				
Baseline FY 88	3.7	13.2	34.4	48.8
100% Regional System	3.4	17.5	34.1	45.1
100% HSP System	8.6	28.5	48.8	14.1
West North Central:				
Baseline FY 88	4.0	14.3	33.4	48.3
100% Regional System	4.7	17.1	34.1	44.1
100% HSP System	7.6	25.2	45.8	21.5
West South Central:				
Baseline FY 88	3.8	19.3	31.0	46.0
100% Regional System	8.6	23.2	34.3	33.9
100% HSP System	10.8	28.3	39.8	21.0
Mountain:				
Baseline FY 88	7.0	19.9	35.6	37.5
100% Regional System	10.2	19.5	30.9	39.5
100% HSP System	8.6	32.4	39.1	19.9
Pacific:				
Baseline FY 88	6.7	22.6	36.0	34.8
100% Regional System	8.5	27.4	33.5	30.5
100% HSP System	11.0	30.5	37.8	20.7

expected to have positive Medicare operating margins exceeding 20 percent under a 100 percent regional or national payment system, only 21 percent of all hospitals would be expected to exceed 20 percent under a 100% hospital specific payment system. The percent of hospitals with positive operating margins would fall from approximately 75 percent under a fully federal system to approximately 70 percent under a fully hospital specific system. Certain categories of hospitals would experience even larger declines (e.g., urban New England hospitals, and rural Mid Atlantic, West South Central, Mountain, and Pacific hospitals).

Perhaps contrary to prior expectations, a 100 percent hospital specific payment system would not reduce the number of hospitals that would experience large negative Medicare operating margins. In fact, the percent of hospitals expected to have negative operating margins exceeding -20 percent would increase slightly from 4 percent to 6 percent under a hospital specific system. Again, certain categories of hospitals are more affected than others in this regard.

The principal advantage in retaining hospital specific rates as part of the Medicare payment system is that it would automatically adjust for errors in the wage index, the relative weights, and other imperfections in the current payment formula. This is evident from the finding that retaining hospital specific rates would clearly minimize the number of hospitals expected to experience large positive operating margins under a fully federal system. There are, however, a number of disadvantages associated with the retention of a hospital specific component. Principal among these is that it would perpetuate varying payment rates among hospitals in a single locality, thereby providing a competitive

advantage to those hospitals with higher historical costs, regardless of whether such higher costs were related to inefficiency or to other variables not accounted for by the payment formulas.

The principal advantage in retaining regional rates as part of the Medicare payment system is that it would protect certain geographically concentrated groups of hospitals from potentially severe financial pressure. It would also reduce the potential for windfall gains to other geographically concentrated groups. Even assuming that all cost differences across regions were due to differences in efficiency, one could argue that hospitals in the New England and East North Central regions be allowed more time to adjust to a less-costly practice style than is currently scheduled. Correspondingly, payments to hospitals in the East South Central region could be more gradually increased to the national rate. While some lengthening of the currently legislated transition to fully national rates may be justified, in the long-run, regional rates may or may not be required. As hospitals respond to the incentives inherent in the Medicare prospective payment system, and as additional refinements are incorporated to correct for the more serious flaws, the need for regional rates may eventually be eliminated.

Blending Hospital Specific and Federal Rates

Retaining a blend of hospital specific rates with either national or regional rates is often offered as an alternative to the transition to fully national payment rates scheduled to go into effect in FY 1988. As was seen in the previous section, there are certain advantages associated with the retention of a hospital specific or a regional component of PPS payment rates. However, even if rate blending were adopted as a

permanent feature of PPS, one important issue remains unresolved: how much weight should be assigned to the hospital specific, regional, and national components in calculating the blend. The simulation results of the previous section do not offer any clear cut guidelines in this regard. Each component has its own set of strengths and weaknesses. If more weight is applied to any one component, it will tend to increase the benfits and costs associated with that component, and reduce the offsetting effects of the other two components.

One proposed method of blending rates was mentioned in Section 2311(f) of the Deficit Reduction Act of 1984 and is similar in concept to the price blending approach at one time advocated by the American Hospital Association. Among the refinements to be included in the study of hospital specific rates, Section 2311(f) mentions payment methods that take into account "the degree of variation in inpatient hospital costs per discharge within each diagnosis-related group."

This approach requires the calculation of a hospital specific/federal rate blend for each DRG. The blending weights would be based on the amount of variation in costs among patients within the DRG, as measured by the coefficient of variation of the mean cost per case. For example, if the standard deviation of per case costs within a given DRG were equal to 75 percent of the mean for that DRG (i.e., the coefficient of variation is 0.75), the PPS payment for cases in that DRG could be a 75 percent/25 percent blend of the hospital specific and federal rates, respectively. Thus payment for DRGs with a wider variation in patient costs would be based more on the hospital specific rate, while payment for DRGs with a narrow cost distribution would be more closely tied to the national or regional average.

A number of simulations were conducted, based on various alternative specifications of the AHA proposal, to identify the impact of using blended rates. Some versions used case weighted coefficients of variations to determine the hospital specific/federal rate blend, others used hospital weighted coefficients of variations. Blending weights were determined using the actual coefficients of variation with a maximum value of 100 percent hospital specific and using indexed coefficients of variation. In the case of indexed coefficients of variation, each DRG's coefficient was expressed relative to the average coefficient of variation across all DRG's. Two key results emerged from the analysis:

- Depending upon the particular choice of parameters, a wide variety of blends could be derived from this approach. The range was from the 75/25 percent blend of the first PPS year to the 25/75 percent blend of FY 1987.
- The estimated effect of using separate blends for each DRG was very similar for almost all hospitals to the effect of computing the average blend for all DRGs, and applying that average to all DRGs.

Therefore, the price blending approach is essentially a method of determining a blend, but depending upon the particular specifications, the blend can be almost anything. Price blending does not provide a method for deciding how much weight, in aggregate, to apply to national, regional, and hospital specific rates.

Whether it be as a permanent feature of the PPS, or in order to lengthen the transition to 100 percent national rates, the choice of an appropriate blend of hospital specific, regional, and national rates is still an unresolved issue. At present it is only possible to identify potential winners and losers under alternative scenarios, it is not

possible to assess whether one set of winners and losers is more appropriate than another set.

SUMMARY

This chapter investigated whether continuation of the regional or hospital specific components of PPS payment rates is an effective means of correcting for potential biases in the PPS payment formula. Ultimately, regional adjustments to PPS payments must be justified by regional differences in the efficient costs of hospital operation. Moreover, to warrant retention of regional payment amounts, regional costs differences must be unaccounted for by other PPS adjustments such as the wage index, the casemix index, the adjustment for indirect teaching costs, and separate urban and rural rates.

The four PPS variables: wages, casemix, residents per bed, and urban-rural location, together explain three-quarters or more of regional differences in mean hospital cost per case. However, after holding these four variables constant, an unexplained range in costs of about 18 percent persists. New England hospitals' costs are still 10 percent above average and East South Central hospitals' costs are 8 percent below average. The remaining variation in standardized hospital costs could be due either to regional variations in hospital outputs or input prices not captured by PPS factors, or to regional variations in efficiency.

Continuation of the regional and hospital specific rates are ways of correcting for these potential limitations. Regional rates would shelter certain geographically concentrated groups of hospitals and reduce potential windfalls to others. However, as hospitals respond to PPS

incentives, and as additional refinements are incorporated, the need for regional rates may be eliminated.

It might appear that retaining hospital specifc rates would automatically adjust for imperfections in the payment formula, and to a certain extent it would. However, the simulation analysis produced an interesting result. The main impact of retaining hospital specific rates would be to reduce the number of hospitals with large positive operating margins. The number of hospitals with large negative operating margins would not be reduced. This result highlights the fact that costs have changed significantly for some hospitals since the 1982 hospital specific base year. The longer the original hospital specific rates are used, the more important becomes the issue of updating them. All things considered, the principal argument against retaining hospital specific rates is that varying payment rates among hospitals in a single locality would be perpetuated, thereby providing a competitive advantage to hospitals with higher historical costs, regardless of the reason for the higher costs.

Finally, even if regional and hospital specific rates were retained, it is not clear what weight should be given each component. The simulations conducted for this report do not offer clear cut guidelines on this issue. It is only possible to identify potential winners and losers under alternative circumstances. It is not possible to assess whether one set of winners and losers is more appropriate than another.

Chapter 6

CONCLUSIONS

This report addresses 5 Congressional mandates and covers a large range of issues with respect to urban-rural and related geographical aspects of PPS. The first major issue was to determine whether refinements are needed to assure that hospitals are not systematically advantaged or disadvantages under PPS by virtue of their geographic location. The next major issue was to examine what types of refinements would be desirable. Three broad types of modifications were considered: (1) refined adjustments for differences in the "output" of hospitals; (2) refined input price adjustments; (3) and other geographical adjustments, such as retaining regional and hospital specific rates.

Extensive computer analyses of Medicare and American Hospital Association data were conducted for this report. A micro-simulation model was used to examine the relationship between hospitals' PPS operating payments and their operating costs (the Medicare "operating margin"). The data analyses yielded the following major findings with respect to the need for refinements:

1. Simulated Medicare operating margins imply that the technical changes in the method of computing the payment rates, enacted in OBRA 1986 will correct a systematic payment bias that has favored urban hospitals at the expense of rural hospitals. OBRA 1986 replaces a uniform 5 percent rate adjustment for outlier payments with separate urban and rural adjustments; and replaces hospital-weighting with case-weighting in the computation of the rates.

2. Under current law, several groups of hospitals that receive special treatment under PPS are expected to be unfairly advantaged:

   - o Disproportionate share hospitals (DSH). The simulated operating margin for all rural DSH hospitals is 100 percent greater than the margin for all rural hospitals. The operating margin for urban DSH hospitals of less than 100 beds is expected to be almost as high as that for rural DSH hospitals. The operating margin for urban DSH hospitals of more than 100 beds is expected to be only slightly greater than the margin for all urban hospitals.

   - o Rural Referral Centers (RRCs). RRCs are expected to have an operating margin that is two-thirds greater than the margin for all rural hospitals. More detailed analyses and recommendations for RRCs are presented in a separate report.

   - o Teaching hospitals. Hospitals with large teaching programs (a resident-to-bed ratio greater than .25) are expected to have an operating margin about 20 percent higher than the margin for all urban hospitals.

3. Simulated margins imply that, as a group, small hospitals (those with fewer than 100 beds) will be systematically advantaged. The result is especially striking for rural hospitals with fewer than 50 beds, whose simulated margin is 50 percent higher than that of all rural hospitals. In contrast, the operating margin of sole community hospitals is only one-half that of all rural hospitals. The special situation of sole community hospitals is addressed in a separate report.

4. Overall, hospitals in the central city core of metropolitan areas do not appear to be be disadvantaged relative to suburban ring hospitals. This result most likely can be attributed to the fact that many core hospitals qualify for indirect medical education and/or disproportionate share payments. The main effect of a core-ring wage index would be to eliminate above average margins for a subset of suburban ring hospitals.

5. Fully national rates in FY 1988 are expected to result in significant variation in Medicare operating margins among regions:

   - o Simulated margins for urban hospitals in New England and the East North Central regions are only one-third and two-thirds as large as the margin for all urban hospitals.

- Urban hospitals in 3 regions have simulated margins that are 20-30 percent higher than the margin for all urban hospitals. These regions are Middle Atlantic, West North Central, and West South Central.

- Rural hospitals in 3 regions have simulated margins substantially lower than the margin for all rural hospitals. The Middle Atlantic, New England, and East North Central margins are approximately one-fourth, one-half, and two-thirds of the overall rural margin.

- Among rural hospitals, only one region stands out with a simulated margin substantially greater than the overall rural margin. The West South Central margin is 50 percent higher than the rural average.

REFINED HOSPITAL "OUTPUT" MEASURES

Separate urban and rural payment rates are a means of accommodating the fact that, on average, urban hospitals have higher operating costs per case than do rural hospitals, after controlling for differences in DRG case mix and the wage index. The PPS adjustments for teaching, disproportionate share, and rural referral center hospitals are further accommodations to the fact that separate urban and rural rates do not account for high cost hospitals within the urban and rural groups. Findings #2 and #3 above indicate the problems with this approach. Relatively high cost hospitals identified for special treatment tend to be overcompensated; within the urban and rural groups, relatively low cost hospitals tend to reap windfalls.

Research suggests that these problems could be mitigated by incorporating into PPS refined measures of hospital "output." Research on these refinements should focus on urban-rural differences in the style of practice. Physicians in urban hospitals practice a more technology-intensive style of medicine that is not reflected in measures of DRG case mix or severity of illness. There is a strong correlation between procedure intensity, hospital size, and teaching activity.

Research suggests that the extent to which a hospital receives patients on referral could be used to capture these differences in place of, or in addition to, some combination of the urban-rural and teaching measures. In time, it might be possible to develop a PPS with one or more continuous payment variables (such as a referral index) that is used to adjust a single national payment rate. Such an adjustor could account for observed urban-rural and bedsize cost differences in a more graduated fashion that is more closely related to the underlying sources of cost variation. Teaching, disproportionate share, and rural referral center adjustments would all be reevaluated in a single rate system of this type.

REFINED INPUT PRICE MEASURES

Detailed analyses were conducted of wage differences among urban and rural hospitals. These analyses supported the hypotheses that urban core hospitals pay higher wages than suburban ring hospitals; and rural hospitals closer to urban areas pay higher wages than rural hospitals in more outlying areas. These findings suggest the desirability of further refinement of the PPS wage adjustment, but do not yield easy methods of doing so. Additional findings to be noted in considering wage index refinements include the following:

- The current wage index is not a source of major payment inequities. Only 17 percent of urban hospitals and 20 percent of rural hospitals have wage indexes that are less than 95 percent of their own wages. Among urban hospitals, most of these receive only 5-15 percent less with an average loss of 8 percent. Among rural hospitals, only 2 percent received less than 75 percent of their own wages.

- As noted earlier, simulated operating margins do not reveal a disparity between the group margins of urban core and suburban ring hospitals.

- An alternative wage index, based on a core-ring distinction for all urban areas and BEA-based rural wage areas, produced a small reduction in the variation of simulated operating margins among selected categories of hospitals.

- Most of the impact occurred within urban areas. Suburban ring hospitals would experience a noticeable decline in operating margins. The proportion of core and ring hospitals with operating margins in excess of 20 percent would be more equal. However, core hospitals as a group are overcompensated relative to ring hospitals.

- Several issues need to be resolved to demonstrate that a core-ring wage index would improve PPS payment equity. Chief among them is the interaction of core-ring location with teaching and disproportionate share status.

- Although research will continue on further refinements of the wage index for rural areas, no clear improvement over the current index is available at this time.

Differences in the prices of hospital inputs other than labor were also investigated for this report. The main conclusion of this effort was that there are currently no data available that would either permit adequate testing of hypotheses about variation in nonlabor prices, or form the basis for an index that could be used in PPS.

Finally, variation in the proportion of labor-nonlabor costs among DRGs was examined. Concern was expressed that hospitals in low-wage areas would be disadvantaged in treating DRGs with high proportions of nonlabor costs. In assuming a constant labor share for all DRGs, PPS would underpay these hospitals for DRGs with relatively low labor cost shares by adjusting too much of their payment by the low wage index. The same logic implies that underpayment may also occur for labor intensive DRGs in high-wage areas. In addition, overpayment may occur for nonlabor intensive DRGs in high-wage areas and for labor intensive DRGs in low-wage areas. Depending on the extent of variation in labor shares across DRGs and the possibilities for over and under payment to occur

within the same hospital, these biases might not have an appreciable impact at the hospital level. The analysis found that variation in labor shares across DRGs is small and is further reduced when hospitals' entire case mix is taken into account. These offsetting factors minimize any systematic bias from the use of a constant labor share.

OTHER GEOGRAPHICAL REFINEMENTS

Differences in 4 PPS variables (DRG case mix, wages, teaching activity, and urban-rural location) explain about three-fourths of regional differences in operating costs per discharge. However, the remaining variation, whose effects are reflected in the regional variation in operating margins presented earlier, cannot be explained by existing PPS adjustments or any of the refined measures of hospital output or input price differences studied for this report.

A number of county economic and demographic conditions were examined and were found to account for about two-fifths of the regional cost variation not explained by the 4 PPS variables. County population density, rental housing costs, and per capita income were most important variables. The impact of these variables on hospital costs is indirect, and may be due either to regional variations in hospital outputs or input prices not captured by PPS, or to regional variations in efficiency.

Continuation of the regional and hospital specific rates are ways of correcting for these potential biases. Regional rates would shelter certain geographically concentrated groups of hospitals and reduce potential windfalls to others. However, as hospitals respond to PPS incentives, and as additional refinements are incorporated, the need for regional rates may be eliminated.

It might appear that retaining nospital specific rates would automatically adjust for imperfections in the payment formula, and to a certain extent it would. However, the simulation analysis produced an interesting result. The main impact of retaining hospital specific rates would be to reduce the number of hospitals with large positive operating margins. The number of hospitals with large negative operating margins would not be reduced. This result highlights the fact that costs have changed significantly for some hospitals since the 1982 hospital specific base year. The longer the original hospital specific rates are used, the more important becomes the issue of updating them. All things considered, the principal argument against retaining hospital specific rates is that varying payment rates among hospitals in a single locality would be perpetuated, thereby providing a competitive advantage to hospitals with higher historical costs, regardless of the reason for the higher costs.

Finally, even if regional and hospital specific rates were retained, it is not clear what weight should be given each component. The simulations conducted for this report do not offer clear cut guidelines on this issue. It is only possible to identify potential winners and losers under alternative circumstances. It is not possible to assess whether one set of winners or losers is more appropriate than another.

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APPENDIX A

REIMBURSEMENT OF RURAL REFERRAL CENTERS UNDER MEDICARE'S PROSPECTIVE PAYMENT SYSTEM

EXECUTIVE SUMMARY

Under PPS, some differences in costs among rural hospitals are explicitly recognized. One group thought to have higher costs are the "Rural Referral Centers" (RRCs). Specifically, the 1983 SSA amendments require that

> The Secretary shall provide for such exceptions and adjustments under this subsection as the Secretary deems appropriate to take into account the special needs of regional and national referral centers (including those hospitals of 500 or more beds located in rural areas)...(Section 1886(d)(5)(C)(i)).

A number of factors have been suggested as causes for RRCs' supposedly higher costs:

1) Their more complex cases require costly special equipment and facilities.

2) The special facilities and complex cases require more highly skilled workers than other rural hospitals. These more specialized workers will be paid more than other workers (e.g., a nurse trained for open-heart operations will receive more than floor nurses). Therefore, costs will be higher.

3) To hire these special workers, Rural Referral Centers compete with urban hospitals which pay higher wages, and this raises RRC payroll costs.

4) RRCs have higher overhead costs on average because the small number of complex cases may not keep special facilities or equipment fully utilized.

5) Referral cases are likely to be those that are the most severe <u>within</u> each DRG category. Therefore, the referral centers' costs will be above the average on which the prospective payment is based.

Ascertaining the extent to which these factors are applicable to qualifying RRCs is the primary purpose of this report. A second purpose is to determine the extent to which these factors explain RRCs' costs. It is possible that other factors, such as the mix of cases across DRG categories, account for most of the cost differences between RRCs and other hospitals, in which case the RRC is automatically covered by DRG-specific payment. Finally, this study will permit an evaluation of the criteria by which RRCs are defined. It is possible that Congress's desire to meet the "special needs" of referral centers is better served by somewhat different criteria than those presently employed.

To study these issues, case studies of six RRCs were combined with computer analyses of data from Medicare Cost Reports and AHA annual surveys. The major empirical conclusions are:

1. Rural Referral Centers' 1984 costs are 13 percent higher than those of other rural hospitals when casemix severity, teaching, and wage differences are taken into account.

2. The higher RRC costs appear to be largely "explained" by their proportion of referral cases and their larger number of beds, which is a proxy for unknown excluded explanatory variables.

3. A refinement to the PPS system that adjusted for the appropriate variables proxied by bedsize should correct the RRC problem with respect to other rural hospitals.

4. Holding casemix severity, teaching, and wages constant, RRCs' costs are not similar to those of the average urban hospitals in that the difference of about 10 percent is statistically significant.

5. The RRC/urban cost differences appear to be largely explained by proportions of outlier payments.

6. RRCs pay wages that are 6 percent higher than the level prevailing in their labor market areas. This would not be corrected by a separation of the rural wage rates for areas adjacent to urban areas from those areas not adjacent.

7. High-cost-outlier RRCs were not found to be any nearer to SMSAs, which could have explained their higher costs.

8. "Large" rural teaching hospitals are not more costly per case than "small" rural teaching hospitals when casemix severity and wages are taken into account.

These findings support the following policy recommendations:

- Rural Referral Centers be paid a Federal payment rate set halfway between the rural and urban rates after transition.

- After transition, if new adjustments to PPS payments are made, such as introducing a referral adjustment, that the RRC Federal payment rate be recalculated, based on the new PPS parameters.

- No adjustment be made in the labor-specific portion of the RRC's federal standardized payment amount separate from a systemic correction of the Federal wage adjustment.

- No special adjustment be made for large rural teaching hospitals beyond the existing add-on for indirect medical education costs and perhaps some systemwide refinement employing an additional hospital output measure.

APPENDIX B

REIMBURSEMENT OF SOLE COMMUNITY HOSPITALS UNDER MEDICARE'S PROSPECTIVE PAYMENT SYSTEM

EXECUTIVE SUMMARY

Under the Prospective Payment System (PPS), certain hospitals have been designated as Sole Community Hospitals (SCHs). These hospitals are the dominant providers of hospital services in their local communities. In order to qualify for SCH designation, regulatory provisions provide that a hospital must be in a rural area and meet one of the following conditions:

1) The hospital is located more than 50 miles from other like hospitals;

2) The hospital is located between 25 and 50 miles from other hospitals and meets one of the following criteria:

   a) No more than 25 percent of the residents or (if data on general resident utilization are not available) no more than 25 percent of the Medicare beneficiaries in the hospital's service area are admitted to other like hospitals for care;

   b) The hospital has fewer than 50 beds and the intermediary certifies that the hospital would have met the above criterion (2a) were it not for the fact that some beneficiaries or residents were forced to seek care outside of the service area because specialty services were unavailable at the community hospital;

   c) Because of local topography or periods of prolonged severe weather, the other like hospitals are inaccessible for at least one month out of each year;

3) The hospital is located between 15 and 25 miles from other like hospitals and because of local topography or periods of prolonged severe weather conditions, the other like hospitals are inaccessible for at least one month out of each year.

There are two unique reimbursement features of SCHs under PPS law. Sole Community Hospitals will be reimbursed at 75 percent of the hospital-specific rate and 25 percent of the applicable regional rate indefinitely. Furthermore, a SCH is eligible for additional payments if it experiences more than a 5 percent decrease in its total discharges over a one year period due to extraordinary circumstances beyond the hospital's control. The Omnibus Budget Reconciliation Act of 1986 extends for two years beyond the phase-in period for PPS the provision of additional payments to SCHs that experience a 5 percent decrease in volume.

This report provides descriptive findings on the characteristics of Sole Community Hospitals, analyzes their definition and reimbursement methods, and provides recommendations for Congress on the future treatment of SCHs.

Rural SCHs are smaller and are located in more sparsely populated areas than other rural hospitals. However, the proportion of their patients who are Medicare eligible is about the same as for other hospitals. Rural SCHs also provide on average almost the same mix of ancillary services as do other rural hospitals. However, the occupancy rate for SCHs is lower than for other hospitals. As a result, the unadjusted cost per admission for rural SCHs is much higher than for other rural hospitals, and their average cost per day is as high as for urban hospitals.

There are differences between those Sole Community Hospitals that received their designations before PPS and those that were newly designated under PPS. The SCHs with older designations tend to be

located in even less densely populated areas, are smaller, have lower occupancy rates, offer a smaller range of services, and have higher costs. Also, a much lower percentage of these SCHs that were grandfathered into PPS are located in the West North Central region.

Rural hospitals have far higher rates of government ownership than do other hospitals. Their cost situations may be one important reason for their greater government dependency. Rural SCHs have substantial amounts of unused capacity, either because it is considered necessary for stand-by use, or because the service simply cannot be provided on a smaller scale. Public support is therefore needed to support this capacity.

The use of service area criteria to define SCHs must involve some decisions that are arbitrary in terms of the exact thresholds used to define distance or market shares. Empirical research on travel times can provide a general sense of reasonable distances, but cannot provide specific values to be used in regulations. However, the limits contained in the SCH criteria would appear to allow hospitals to become eligible for SCH status under reasonable conditions. These conditions are that the hospital is the dominant provider of health care in its area, and the time that would be spent in travel to an alternative hospital would be clearly longer than the average travel time for patients in other areas where the choice of hospitals is more plentiful.

The specific criteria for designation of SCHs do not have any precedent in previous regulations. However, earlier nonbinding guidelines and previous planning standards contain limits that are similar to those contained in the PPS regulations.

There is a large variance of costs around the average for Sole Community Hospitals, and possibly as many as a third of SCHs would receive higher levels of payment from the federal rate for their region than from the 75%-25% reimbursement rate formula. This comparison may motivate some of them to consider opting out of their special status.

Rural SCHs, as of 1981, were operating at 49% capacity, with 1-out-of-3 below 40%. Moreover, 1-in-4 had volume declines of more than 5% in a typical year. The same was also true of other rural hospitals, despite their higher (56%) occupancy rates. Only when a 10% threshold was used did we find that SCHs were uniquely vulnerable to volume declines compared to other rural hospitals (15% of SCHs versus 10% of other rural hospitals in the typical year).

Furthermore, the vast majority of SCHs experiencing large volume declines also had offsetting, large increases in subsequent years. About 3-in-10 SCHs potentially eligible for volume protection would have enjoyed at least two years of large volume increases over just a five year period.

The administrative determination of a hospital's fixed costs and whether a volume decline was due to extraordinary circumstances require an expenditure of HCFA and hospital resources and will result in determinations based partly on judgement and subject to appeal. Simulations of PPS cost impacts due to SCH volume protection for <u>all</u> volume declines beyond the 5% threshold indicate that annual outlays would be very minor (i.e., $5-10 million) relative to the program as a whole, although amounting to as much as 5% of total annual costs for eligible SCHs. Simulations using a 10% threshold reduced the outlays by

about one-third. Finally, simulations using a positive volume offset might actually result in net transfers from SCHs to the government, as large volume increases exceeded decreases between 1977-81.

For the definition of Sole Community Hospitals, HCFA recommends that

- o the general SCH criteria be retained largely in their present form, and that
- o the Prospective Payment System retain the provision grandfathering in those hospitals that had already received SCH status prior to the implementation of PPS.

As for the basic reimbursement formula, HCFA recommends that

- o the current 75 percent hospital-specific rate/25 percent federal rate reimbursement formula be retained; however, after the transition, the federal rate would be the national rate rather than regional rates.

HCFA recommends the following changes regarding the volume shelter reimbursement mechanism:

- o the SCH volume shelter continue to be triggered at the 5% threshold;
- o provisions be established to recover volume shelter payments from those SCHs that were assisted when they experienced large admission volume increases during the two-year period following the year of large admission volume declines.

The recovery provision would provide a form of self-insurance, with short-run "borrowings" for declines being paid back (as least partially) in future years. This would contribute to the financial needs of other SCHs in financial distress and result in smaller budgetary outlays overall.

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